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A Study of the Outdoor Environmental Design of High-rise Residential Area (HRFRAs), China

Application and investigation of the Environmental-behaviour theories and research
methods for Landscape Design

by

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The thesis is submitted to School of Landscape Architecture

At Edinburgh College of Art/Heriot Watt University

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Preface

High-rise flats can be found in big cities everywhere around the world. Their usage results from the huge capacity to house many people and the small ground plot ratio. The Chinese government adopted this dwelling pattern in the late 1980s as a long-term strategy to meet the land shortage and the urgent need for accommodation. From affordable house to new middle class high-rise flats, more and more Chinese urban citizens live in these concrete shelters. In Beijing, about two-thirds of new built residential areas (about 196) are high-rise (Zhang, 2006).

“The earliest ways of modifying the world to make it more habitable had to do with simple shelters, the domestication of crops and animals, and the location of settlements near sources of food, fuel, and water. Step by step, we arrived at modern urban structures and came to know the residential area as a whole, incorporating both the microscopic and the macroscopic. We are still some distance from understanding the degree to which man-made settings should duplicate the natural environments in which the human species is presumably adapted; or to what degree our health declines or improves when we depart from those primitive features” (Lynch, 1985, pp.127).

Chinese philosophy pursues the idea of the “integration of heaven and man”. A natural environment as the connection between human-beings and an unknown universe, takes an important role in the whole system. People try to follow, understand, utilise, and further, to live in harmony with the environment. This inclination is an obvious issue among the high-rise residents, in the situation that high-rise building separates residents from the natural environment far more than the traditional court-yard house.

With almost a decade of development, Chinese high-rise residents’ voices calling for a high quality outdoor environment is becoming stronger and stronger. As a result, the past decade has seen a transition from a time when the quality of the outdoor environment of a residential area did not play much of a role, to a new situation, where landscape design quality is crucial for high-rise residents’ quality of life.

Although landscape architects have done many jobs to improve the outdoor environmental quality of the high-rise flats, they have to encounter the lack of first hand data and references of the theories to establish the relationships that exist between residents and the environmental aspects. This kind of shortage necessities more outdoor environmental studies.

With human-beings at the centre of design, this study refers to environmental psychological theories and relevant design principles to establish a body of relevant evidence through an on-site investigation of three big Chinese cities. The result of this study can provide some relevant themes and some information for landscape design.

Abstract:

Designers often believe that environmental design improves quality of life. Preference as an index of motivation has influences on many aspects of people. Based on a study of the relationship between actual uses and preferred outdoor environments, this research aims to deepen our understanding of place via public input and to improve the design quality of the central community garden (CCG) of high-rise flat residential areas (HRFRAs) in China.

With a total of 902 respondents from six HRFRAs, the investigation was carried out in three major Chinese cities, Beijing, Shenzhen and Hangzhou, in September 2006. Analysis at a general level reveals the preferred environmental patterns and significant predictors of the respondents' actual use. The comparisons at the city level indicate the territorial differences and characteristics of each city, respectively.

Analysis of the results indicated that a quiet, green environment in an informal design style was the preferred environment which would improve residents' frequency of use. Of the environmental elements, waterscape and evergreens were particularly important to users. Although both of them are important to people's actual use, the effect of the prospect indicator (perspective of the CCG looking from a resident's window) was relatively weaker than the indicator of affordances, such as exercise facilities and children's playgrounds, etc.

On the other hand, the results of the study explain the gap which often occurs between landscape architects' intentions and the manner in which the elements of the design actually work, in users' opinion. Landscape designers of the HRFRAs in China need to reorder the emphasis of the design aspects and adjust the contents of the environment to satisfy users' social, functional and psychological needs.

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Chapter 1: The Central Community Garden in Context

Part One: Literature Review

Community gardens are a form of urban agriculture that have been growing in popularity around the world. They are spaces where people can grow their own food, connect with others, and learn about sustainable living. Community gardens can be found in urban areas, rural areas, and even in schools and prisons. They can be used for a variety of purposes, including food production, education, and recreation. Community gardens can also be used to address social issues, such as food insecurity and lack of access to fresh food. Community gardens can be a valuable resource for communities, and they can help to create a more sustainable and healthy future.

There are four different ways to categorize the design of a garden: 1) based on the type of plants, 2) based on the size of the garden, 3) based on the location of the garden, and 4) based on the purpose of the garden. Each of these categories has its own set of characteristics and challenges. For example, a garden that is based on the type of plants might have a specific focus on growing certain types of vegetables or fruits. A garden that is based on the size of the garden might have a different set of challenges than a garden that is based on the location of the garden. A garden that is based on the purpose of the garden might have a different set of goals than a garden that is based on the type of plants.

Community gardens can be used for a variety of purposes, including food production, education, and recreation. They can also be used to address social issues, such as food insecurity and lack of access to fresh food. Community gardens can be a valuable resource for communities, and they can help to create a more sustainable and healthy future.

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Chapter 1: The Central Community Garden in Context

High-rise buildings are popular in many big cities all over the world. It is easy to identify these buildings in the urban environment. Compared to other kinds of buildings, high-rise flats have three characteristics - the height of the buildings, the density reflected in the average number of residents per unit, and the plot ratio. Different countries have different criteria. The most popular way to distinguish high-rise flats from other dwelling patterns is in terms of their height and plot ratio.

There are four different ways to measure the density of residential areas (PRP, 2002, p.14): 1) Habitable rooms per hectare and per acre—this is the most common measure used most commonly in London, for example, where a three-bedroomed house with a single and two double bedrooms, a kitchen, living room and bathroom counts as having four habitable rooms. Small kitchens and bathrooms do not count. If, however, the house had a dining kitchen, then it would have five habitable rooms. 2) People or bed space per hectare or per acre — using the above example, the three-bedroomed house would sleep up to five people. This is what is meant by bed space, thus we talk of a three-bedroomed, five-person house as having five bed spaces. 3) Plot ratios — a plot ratio is another means of measuring density. It is the total area of the building, i.e. the footprint or floor area, times the number of storeys, divided by the area of the site. Thus if the site is 1 and the floor area is 1 and there are three storeys, the plot ratio is 3.

The Emporis Standards Committee defines a high-rise buildings, as “a multi-story structure with at least 12 floors or 35 meters (115 feet) in height” (Figure 1-1) (website 1). In this criteria, a high-rise building is distinguished from other tall man-made structures by the following guidelines: a) It must be divided into multiple levels of at least two metres height; b) If it has fewer than 12 such internal levels, then the highest undivided portion must not exceed 50% of the total height; c) Indistinct divisions of levels such as stairways shall not be considered floors for the purposes of eligibility in this definition. Any method of structural support which is

consistent with this definition is allowable, whether masonry, concrete, or metal frame. In the few cases where such a building is not structurally self-supporting (e.g. resting on a slope or braced against a cliff), it may still be considered a high-rise building but is not eligible for any height records unless the record stipulates inclusions of this type.

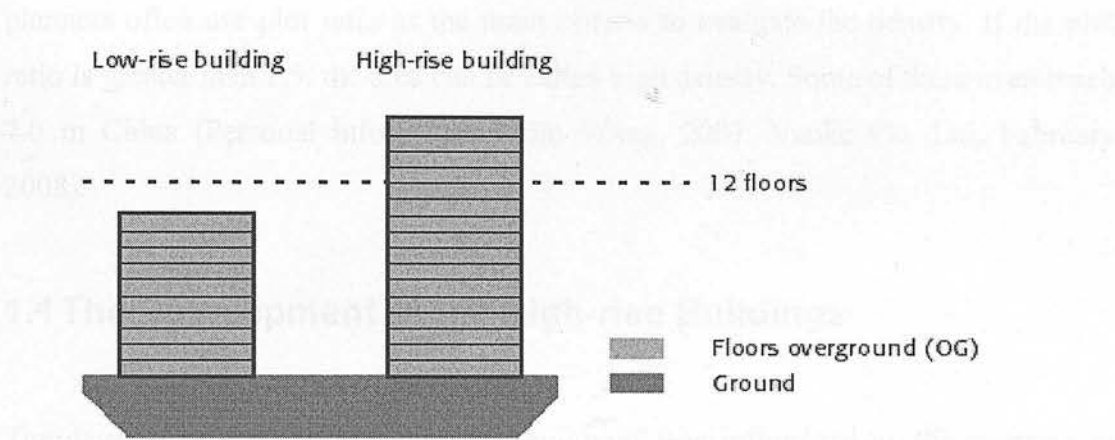


Figure 1-1: The altitudinal difference between low-rise and high-rise buildings

The International Conference on Fire Safety in High-Rise Buildings defines a high-rise as “any structure where the height can have a serious impact on evacuation”. Massachusetts General Laws define a high-rise as “being higher than 70 feet (21 m)”. Most building engineers, inspectors, architects and similar professions define a high-rise as “a building that is at least 75 feet high (23 m)” (website 2).



Figures 1-2: A comparison between high-rise flats (left) and low-rise flats (right)

In China, the distinguishing feature of a high-rise building from other buildings is the number of its floors. According to the ‘Design code for residential buildings, State

Construction Ministry of China, GB 50096—1 June, 1999', High-rise residential buildings are those higher than 10 storeys (website 3). Figure 1-2 show what a High Rise Flat Residential Area (HRFRA) and Central Community Garden (CCG) looks like.

In most situations, the high altitude means high density in China. Architects and planners often use plot ratio as the main criteria to evaluate the density. If the plot ratio is greater than 1.5, the area can be called high density. Some of them even reach 7.0 in China (Personal information from Wang, 2007, Vanke Co. Ltd, February 2008).

1.1 The Development of the High-rise Buildings

The development of modern high-rise buildings was influenced by the progress of architecture and urban planning. As a symbol of modern architecture, a high-rise building was often described as a breathtaking one, given the profile that it had. In the first few decades of the 20th century, the visual impact which high rise buildings had gathered much praise. New technology and design ideas made people overestimate the effects of high-rise buildings on people's quality of life. In that context, the innovative value of high-rise buildings was so high that it covered up the weaknesses.

Traditional construction techniques limited the architectural development of the high-rise building. It was only at the end of the 19th century that modern industrial techniques were applied to architectural construction, such that people could create architectures in a different way but it was at the beginning of the 20th century that a high altitude architecture began to be distinguished from the norm. In the design timeline, the modern high-rise flat can be seen as the result of the Chicago 'loop architects' who solved the technical problem of building high, such that high buildings spread quickly throughout the world (Plunz, 1990).

As the modernist era advanced, the early twentieth century witnessed the building of high-rise flats which were initially assessed as adding to people's lives. Enlightened by Auguste Perret, the French architect, envisioned an urbanism of high towers

within a park, the idea of a “city in a park”. Perret was a famous architect and engineer, renowned for his experience in the use of reinforced concrete. His advocacy of and expertise in concrete construction gave a far-reaching significance to high-rise dwellings and urbanisation. In the early 1920s, his vision was elaborated by his student, Le Corbusier.

Ebenezer Howard’s “Garden Cities of To-morrow” (originally published 1898; published as *Garden Cities*, 1902) might have had some influence on Le Corbusier. In the 1920s, his theory was for a utopian vision. It was translated into a buildable form by the German architects Marcel Breuer, Walter Gropius, and Ludwig Hilbersheimer. Their proposals for ‘slab blocks’ were literally towers in a park: high-rise elevator buildings, simple rectangles in form, dispersed in a green setting.

Almost ten years later, Gropius pointed out that the effect of a high-rise building in an urban area was to “increase density, reduce coverage, and improve light and ventilation” (Plunz, 1990, p.189). In this situation, the focus of the high-rise shifted from an old area to a new one, where its function was to offer a shelter to people and to provide an aesthetic of a building only. However, people’s basic needs were interpreted mechanically as criteria which designers should follow.

Although the idea which architects advocated was different from Howard’s garden city idea, both them aimed to relieve the congestion of the city. Howard advocated the low density and satellite town as the main form of city development (a garden city is a town designed for healthy living and industry; of a size that makes it possible to enjoy a full measure of social life, but not larger; surrounded by a rural belt) which is opposite to the modernist approach. On the opposite side, the idea of Perret’s “city in a park” put the man-made environment in amongst the natural one rooted in an understanding of its functions in relation to people as being mechanistic. It did not put the natural environment and human-beings’ health at the centre of design but as a decorative element of the grand city space.

In the early twentieth century, European countries and the USA experienced the same fever on building high-rise flats. But the heyday of the high-rise flat came after WW2. It bloomed in many countries that had experienced extensive war damage. Governments adopted this dwelling pattern as a response to resolve the housing

shortage and regenerate the economy. From the late 1950s, a vast number of high blocks of flats were built in all parts of Britain (Glendinning & Muthesius, 1994, p.61). At the same time, in postwar Europe, the population increased quickly. Young people wanted to have their own families. Governments needed an easy and fast way to resolve their housing problems. Between 1966 and 1973, over 60% of the social sector housing built in the Netherlands, and two-thirds of the social housing in France, consisted of high-rise blocks (Wassenberg, 2004, p.9).

Behind these advantages, however, problems began to occur, in terms of high-crime rates, poor social interaction and the separation of people from the natural environment. These issues all subsequently arose. While it was realised that the physical environment could be improved by amending the infrastructure, however, it was difficult to resolve the social and other problems via simple physical infrastructural improvements.

By the 1960s and early 1970s, the popular high-rise flat was facing much criticism. People turned to pursue a more healthy life which included many aspects. In this situation, people realised that the harmonious relationship between them and the physical environment was an important one. Human-beings became the focus of study and addressing their needs was seen as the criterion which should determine how the physical environment should be evaluated and designed.

In the late 1950s, computer and environmental psychology had played an important role in the process of helping people to carry out these types of studies, with human-centred, environmental psychology introduced as an important subject relevant to this field.

In this context, the building research station in Britain had carried out some early user studies (Hole and Attenburrow, 1966). By the end of the 1960s, the whole idea of high-rise living was widely criticised, and further studies of this type of housing began to appear. Researchers tried to probe the reasons for the problems that had emerged from this dwelling pattern, especially the social problems. "Widespread enthusiasm for these blocks changed into an equally widespread hatred of them" (Glendinning & Muthesius, 1994, p.307).

From the late 1960s, the drive to transform cities in the modernist image slowed

down and was abandoned. High-rise housing for low-income groups was rejected due to the costs and social problems that it incurred (Barnett, 1982, Madanipour, 1996). Newman (1972) and Jacob (1966) criticised this kind of house from different angles. The critics saw the utopian images of high-rise housing in parks as “planned by a paternalistic authority, which offered hopes of improved standards but also ran the risk of trapping people in dwellings not of their own choosing” (Coleman, 1985, p.6).

Compared to the prosperity of the early 1920s, the demolition of the Pruitt-Igoe apartment (Figure 1-3, right) made people re-evaluate this dwelling pattern.

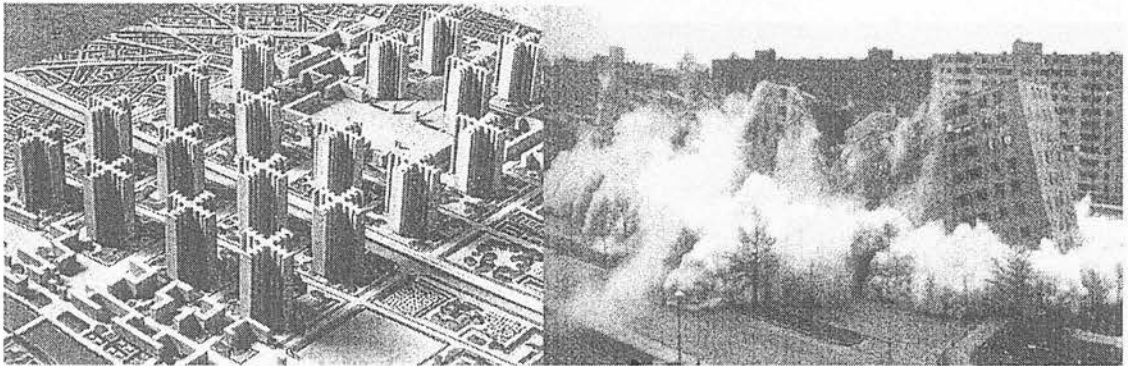


Figure 1-3: The rise and fall of the high-rise flat

Le Corbusier's 1925 Plan Voisin for Paris, the great shock image of twentieth-century urbanism 1(left); Minoru Yamasaki's Pruitt-Igoe high-rise towers in St. Louis, demolished in 1972. 1 (right) (Source: Fishman, 2004).

The type of problems that arose was three-fold: technical; social and financial decline. Wassenberg (2004, p.11) believes that among the problems affecting the lives of high-rise residents such as the design problems of inadequate outdoor space, social problems (such as anti-social behaviours, poor neighbourhood relations and crime), and socio-economic problems (low income and un-employment) becomes very serious issues. Scholars did lots of study on the three aspects respectively.

Although the high-rise flat created many problems in west-European countries, it achieved positive architectural constructions in other parts of the world, even in the 1970s. Many Asian and East European countries treated it as an efficient way to resolve population pressures and the shortage of land resources, for example, Singapore, Tokyo, Seoul (Figure 1-4) and many other big cities built high-rise buildings during the economic boom years of the 1970s.

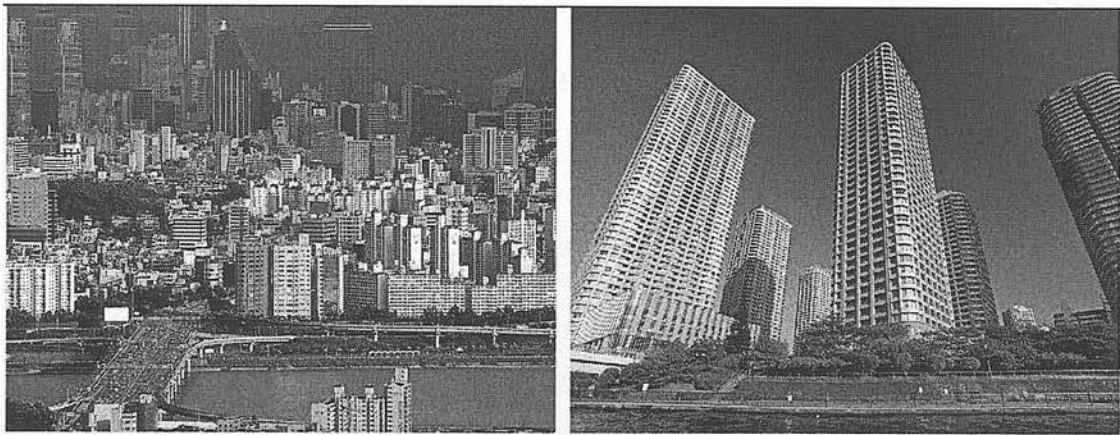


Figure 1-4: High-rise flats in East Asia.
High-rise buildings along the Han river, Soul (left); High-rise flats in Tokyo(right) (website 4)

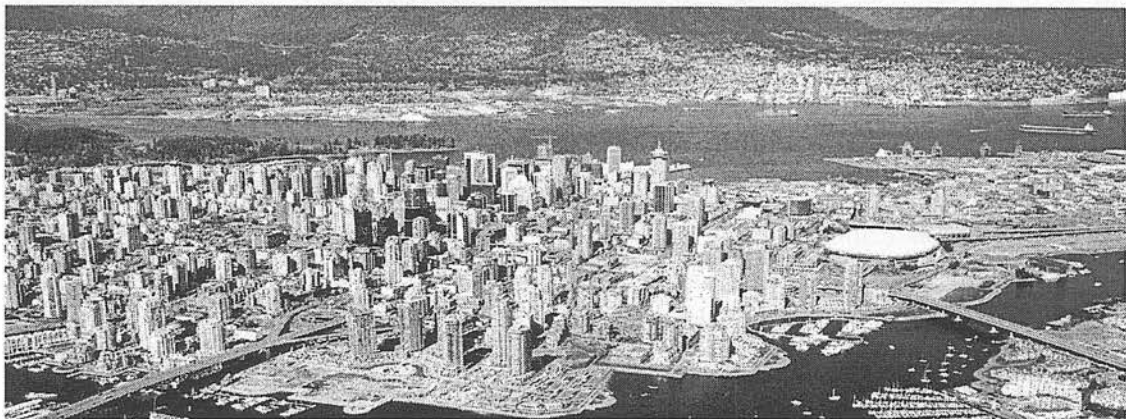


Figure 1-5: High-rise buildings in China (Boddy, 2005)



Figure 1-6: High-rise flats in Eastern Europe
Czech Republic, obvod Praha 10, městská část Praha 15, Hostivař Sídliště Košík, pohled od severu (website 5)

As a typical high-rise city, more than 50% of HongKong residents have moved to high-rise flats since the 1960s. These estates have evolved from seven-storey walk-up apartments with public toilets and minimal amenities, allocated on a basis of 24 square feet. In the late 1980s, China (Figure 1-5) followed this trend, and for the

same reasons as other Asian countries, namely, using high-rise buildings as a long-term policy to resolve the problem of population explosion and rapid economic development. In some Eastern European countries, high-rise flats have remained a popular type of accommodation since the extensive construction of them in the 1970s (Figure 1-6).

The development of high-rise buildings in western European countries restarted after a decade of decline. In the early 1980s, these countries, which by the late 1960s had held negative views of this dwelling pattern, returned to consider the advantages of this building type because it offers extensive accommodation, building shapes (if the designers do the job well) and profit are all attractive features of this housing type. In Finland, for example (Figure 1-7), the proportions of high-rise flats in the 1990s are higher than low-rise flats. The situation was the reverse in the early 1980s.

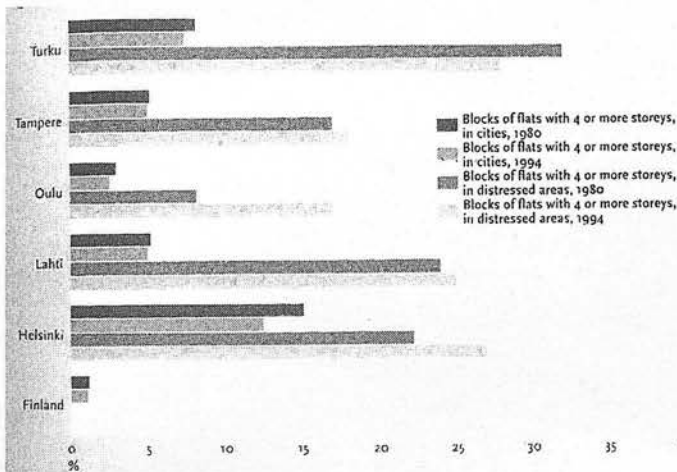


Figure 1-7: The percentages of high-rise and low-rise flats built in Finland (Source: Turkington, 2004)

Researchers and decision-makers realised that the real life of residents' living conditions in high-rise flats was not necessarily as bad as the media image had suggested. Investigations revealed that fewer high-rise flats were in a state of serious dilapidation

than had been thought (Figure 1-8).

This view contradicted that of some modernists and social policy researchers. It was clear from these opposing views that this topic required further academic research which would allow a more general and objective viewpoint to be taken and which would be able to assess if this dwelling pattern was one which was capable of adjustment in response to people's needs and quality of life issues as they changed over time.

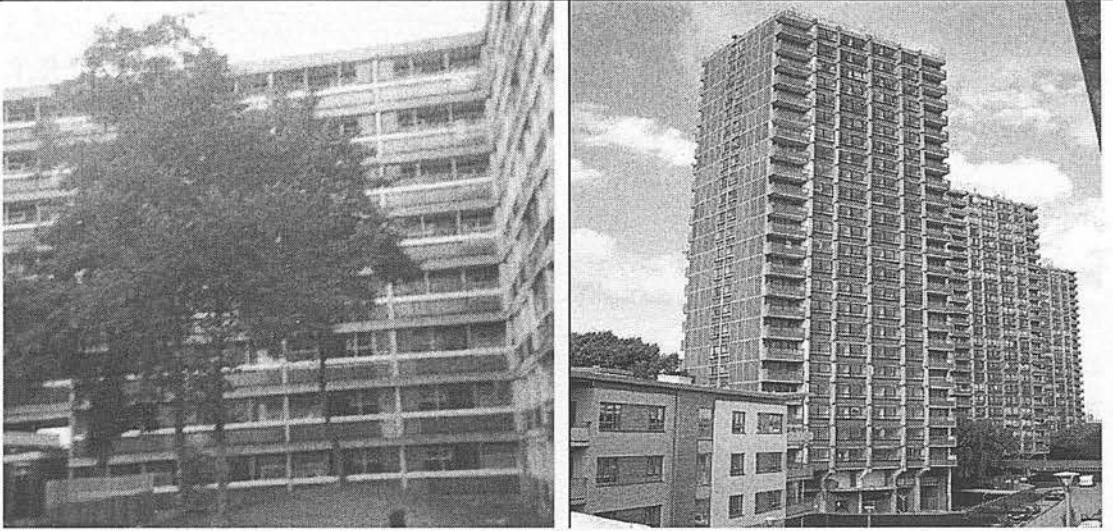


Figure 1-8: High-rise flats in the UK.

Park Court flats in Wythenshawe, Manchester (left) three tower blocks of the Crossways Estate in Bow, London (right) (Source: website 6)

1.2 The Development of the Garden Apartment

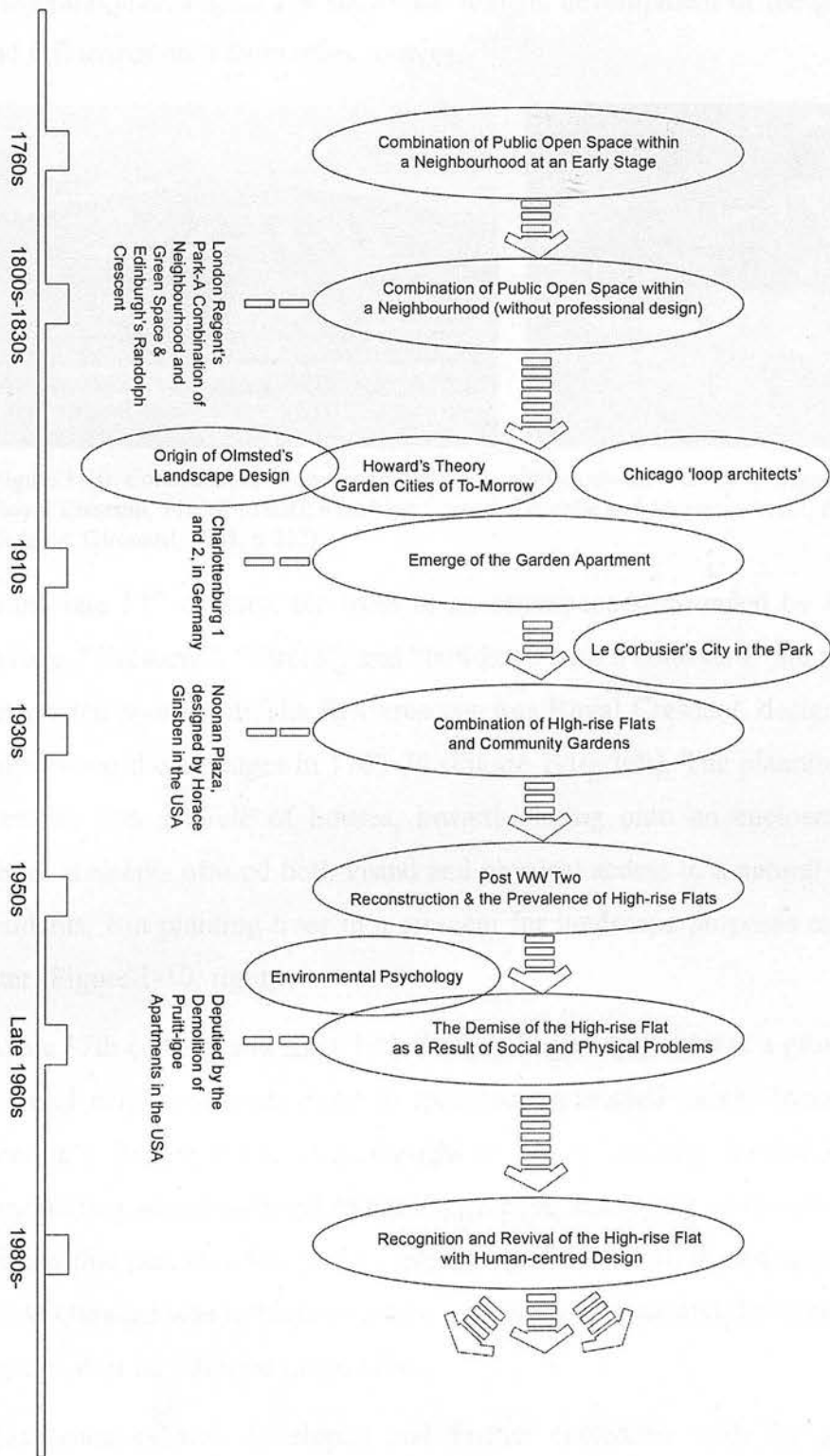


Figure 1-9: The Development of the garden apartment and influences on it from other sources

The term “garden apartment” appeared in New York in the 1920s (Plunz, 1990). It is a form which combines a designed courtyard together with a flat. The garden apartment form can be seen as the contemporary predecessor of the modern high-rise residential area. Figure 1-9 shows the holistic development of the garden apartment and influences on it from other sources.

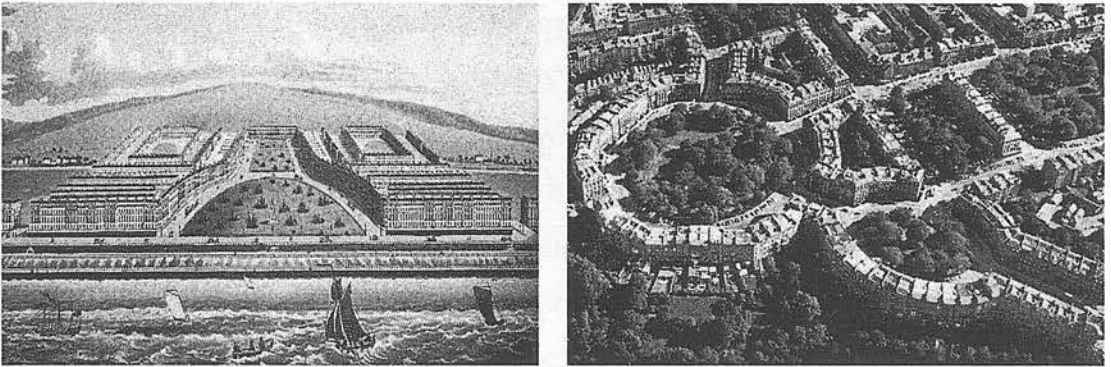


Figure 1-10: Combination of openspace within a neighbourhood at an early stage
Royal Crescent, 1767-74 (left); Randolph Crescent, Ainslie and Moray crescent, Edinburgh (right)
(Source: Girouard, 1985, p.232)

In the late 17th century, the form of an openspace surrounded by flats emerged in Europe. “Crescent”, “Circus”, and “buildings with a courtyard” are the prototypes of the garden apartment. The first crescent was Royal Crescent, designed and built by John Wood the Younger in 1767-74 (Figure 1-10, left). The planning pattern of this crescent was a circle of houses, inward-looking onto an enclosed central space. These crescents offered both visual and physical access to a natural environment for residents. But planting trees in a crescent for landscape purposes emerged 60 years later (Figure 1-10, right).

In late 17th century and early 18th century England, there was a growing enthusiasm to build neighbourhoods close to spacious landscaped parks. These parks, such as London’s Regent Park, were thought to be an amenity for the residents of the surrounding neighbourhood rather than for the whole city or town (Girouard, 1985). During that period, a few parks were also built in this style, and to great effect in the USA. Olmsted was influenced by the practice in Britain and developed the American system after he returned to the USA.

This tendency was developed and further connected with the buildings of the neighbourhood. The first combination of open space with a neighbourhood, in the

modern sense, was Charlottenburg 1 and 2, which were designed by Erich Kohn and Paul Mebes for the Berlin Civil Servants Dwellings Association and completed between 1904 and 1909. These two projects can be seen as the earliest “garden apartments” in any real sense (Plunz,1990).

Between 1933 and 1936, a residential block, Flagg Court, was built in New York. This block was a ten-storey building, incorporating a courtyard and some amenities, including two swimming pools, a tennis court, an auditorium and other social features, such as recreation rooms, a bowling alley, and a large roof playground. These facilities were physically integrated into the courtyard to form a kind of public place, which could bring together residents when they used them. Basically, Flagg Court was a continuity of the garden apartment of a decade earlier. Although some people treated it as an anachronism (it was built in the Depression), Flagg Court can be seen as “typifying the new generation of new form and technology” (Plunz, 1990, p.214).

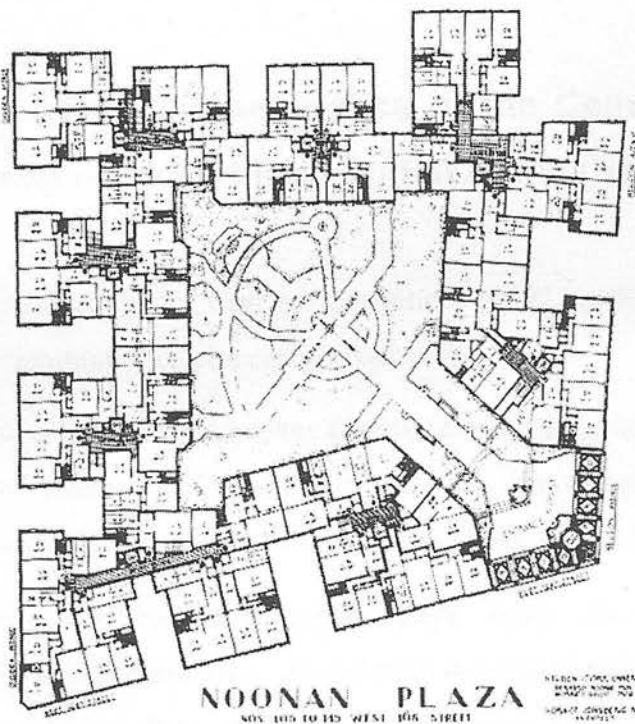


Figure 1-11: Plan of Noonan Plaza (designed by Horace Ginsbern, Source: Plunz, p.147)

In the beginning, this combination gave the central courtyard only a decorative function, and did not require putting in too much design effort to make it attractive. Not until 1931 was there a community garden which involved modern landscape design skills, namely, in Noonan Plaza (Figure 1-11), which was designed by Horace Ginsbern. It is an eight-storey perimeter structure, designed with a Mayan Deco motif and a garden courtyard, which

boasted a waterfall and ponds stocked with goldfish and swans. The self-administration area are all characteristics of modern residential areas.

During this time, designers focused on the beauty of the environment. A fine courtyard image suggested the high environmental quality. The image of the internal courtyard in the Thomas Garden Apartments (Figure 1-12), shows the “Japanese garden” which contained artificial water course and bridges.



Figure 1-12: Photo of the internal courtyard of the Thomas Garden Apartments (Source: Plunz, 1990, pp.156)

From the 1920s to the 1950s, many residential areas were designed according to functional criteria, such that the function of the garden around the buildings became more and more of an issue. Designers and users became more aware, generally, of the impact of the outdoor

environment on residents' life quality.

1.3 The Characteristics of the Central Community Garden of High-rise Flat Residential Areas (HRFRAs) in China

According to Carr's description (1992, p.80) the outdoor environment in a community can be categorised as follows:

1. Community gardens: These are small plots of land allocated to groups of people by some organisations that hold the title or lease to the land, sometimes they are available for rent, sometimes simply as a grant of land.
2. Neighbourhood parks: these open spaces are developed in residential environments. They are publicly developed and managed as part of the zoned open spaces of cities, or as part of new private residential development. They may include playgrounds, sports facilities, etc (Carr, 1992, p.80).
3. Community open spaces: these are neighbourhood spaces designed, developed, or managed by local residents on vacant land; they may include viewing gardens, play

areas, and community gardens; they are often developed on private land; they are not officially viewed as part of the open-space system of cities; and they are often vulnerable to displacement by other uses such as housing development.

4. Communal garden (often used in the plural as communal gardens) is a shared garden for use by a number of residents, for example, the centre of many city squares and crescents (e.g., in London and Edinburgh) are maintained as communal gardens. Despite the name, such gardens are normally privately or jointly owned, with maintenance costs shared. Access may be restricted by locked gates, with keys available for residents, or only unlocked during the daytime (website 7).

Compared to its European counterparts, the Central Community Garden in Chinese HRFRA is different in three ways from the neighbourhood park, community open spaces, and community garden:

The first difference is in terms of ownership and management:

The ownership of the Central Community Gardens attached to HRFRA in China belongs to the real estate developer, not the residents. They do not have the right to change any part of the garden. The CCG, therefore, is different from the community garden which has many small plots of land allocated to groups of people by some organisations that hold the title of, or lease to the land, and sometimes for rent.

The CCG is created to provide a relaxing environment for residents, who do not have to maintain the environment or concern themselves with the cost problems in this situation. The CCG, Likewise, is different from neighbourhood parks and community open spaces which are managed by residents themselves.

The second difference is that user groups are relatively fixed.

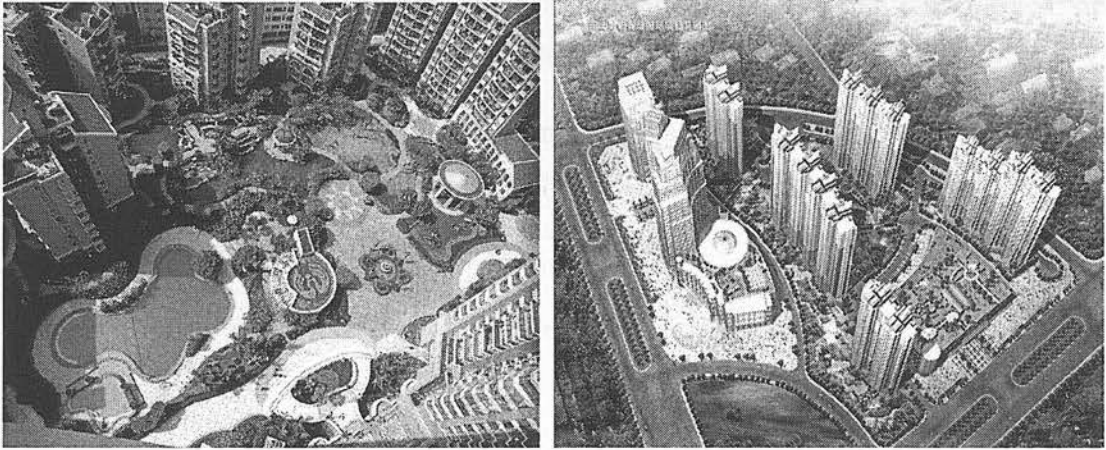
The border of a HRFRA is often enclosed by fences and gates to keep outsiders away from the internal environment thus the likelihood of any disturbances for residents is reduced. When the community security is increased, the environment of the high-rise residential area becomes separated, relatively, from the other urban areas.

The third difference concerns the residents of the HRFRA in China.

After the housing policy reform in the late 1990s, people could buy and sell the privatised state-owned houses. This process also accelerated the development of the

real-estate market. The result was, and is, that people who are from a similar economy background and who can afford to buy this kind of flat, often gather in the same community rather than in the areas which were built by the government.

Compared to the residents of the affordable housing in Britain, high-rise flats in China often accommodate middle-class residents. The six projects in the three cities of Beijing, Hangzhou and Shenzhen, which the author investigated for this study, all consisted of middle class communities.



Figures 1-13: Images of CCGs in China.

The form of the CCGs in China might not have big difference to their counterparts in America. Although the CCG has different forms, according to the planning pattern of the particular HRFRA, the common feature is that an open space is embedded into the space between the high-rise buildings (Figure 1-13).

Summary:

The combination of a high-rise flat and a community garden has evolved as a result of the development of construction techniques and the nature of human-beings.

The modern city, since the Industrial Revolution, has attracted massive population growth, needs high-rise, high-density dwellings to accommodate its migrant workers. The condition was made particularly urgent after WW2. The “rebuilding of cities”, the “population explosion” and the “shortage of land resources” propelled the development of the high-rise building.

Chapter 2: The Central Community Garden and its place within the Community of High-rise Flat Residential Areas

Compared to low-rise housing, the physical environment of high-rise buildings in has changed. The high altitude and high population density influence people's daily life. Many studies showed that the separation of high-rise residents from landscape and nature must be given attention to resolve this situation.

2.1 The Importance of the Outdoor Environment

2.1.1 Physical Improvement:

The economic issue was an important element which determined the initial development of high-rise buildings. Although there was a belief that the reduced ground level per person would increase costs, developers also believed that the social good and the better conditions for light and air that residents could expect would allow higher rents to be set. With these issues in mind, Thomas, who submitted a scheme to the competition sponsored by the Phelps Stokes Fund, in 1921, advocated making a profit by reducing building coverage and increasing environmental quality (Plunz, 1990, p.141). Though these "garden apartments" were all five to six-storey buildings which now can not be regarded as true high-rise, the courtyard and peripheral area was designed and considered before the buildings' construction. Soon, the evidence suggested that the profit from the rents of more accommodation covered the construction expenses. On the other hand, people's doubts about this type of accommodation were overtaken by the urgent housing needs of the city.

With the development of urban areas, population density and the shortage of land, designers and developers were forced to adopt high-rise buildings in order to meet housing requirement. This particular dwelling pattern, however, became more

popular gradually. One of the side-products was the spacious outdoor environment which was created by the high-rise flats.



Figure 2-1: Baruch houses site (Plunz, 1990, p271)

Before the wave of “towers in the park”, which brought a radical decrease in coverage from 90 percent to slightly more than 10 percent, the open space inside the site was not taken into account. As a result of the implementation of high-rise, more spare spaces were left on site. In these low-ground coverage, high-rise residential

areas—the percentage of ground footprint was lower than 20 — the big, spacious outdoor environment became an independent part of the residential area. This phenomenon was at its peak in the 1950s. The Baruch Houses project was completed in 1959 by Emery Roth and Sons (Figure 2-1). It consisted of 17 towers scattered over fifteen Manhattan blocks, with coverage of 13.4 percent. In these situations, neglect of the large area of the outdoor environment was impossible. However, the outdoor environment did not attract enough attention at the beginning of that decade.

The construction of a high-rise building is motivated by commercial considerations. To achieve a higher profit, real estate developers increase the plot ratio and decrease the ground coverage of the building continuously. One of the original purposes associated with this building type, of providing residents with “sun, air and greenery”, is thus threatened. To resolve this situation, the Chinese government imposed restrictions which aim to keep the rights of residents. In this circumstance, the compulsory regulations-“Chinese Design Code for Residential Buildings” ensure that each flat gets at least two hours of sunshine during the winter solstice and a further rule states that at least 30% of the residential area should be reserved for landscape. These rules restrict real estate developers’ construction activity and preserve residents’ rights to accessible nature. All these actions reinforce the possibility of environmental design within Chinese HRFRA.

2.1.2 Social and Healthy Improvements

In the history of the community garden, if the 1960s and early 1970s were marked by concern for social problems when political and socio-economic aspects being the key focus, 1980s might be remembered as a time when quality of life issues began to be given attention (Carr et al. 1992; Francis, 2003).

In the early stages, the community garden worked as the decorative element of the high-rise flats. Most of the studies focus on the outdoor environment were for aesthetic purposes and social problems reflected in these environments.

Jacobs (1961) argued that modernism removed almost everything from cities and made the city lack life. She attacked the simplistic and reductive concepts of the city with functional divisions into urban districts, and urged a return to a small-scale, diverse cityscape. She believed that high-rise buildings destroyed normal urban life, and at a social cost that outweighed questionable short-term construction economies. She was also doubtful about the totalitarian aesthetic of large-scale urban form, from Burnham's 'City Beautiful' to Le Corbusier's 'Ville Radieuse'. Jacobs said that to approach a city, or even a city neighbourhood as if it were a large architectural problem, capable of being given order by converting it into a disciplined work of art, is to make a mistake of attempting to substitute art for life. The results of such profound confusion between art and life are neither life nor art.

High crime rates were another important reason for these disagreements about high-rise buildings. Oscar Newman (1972) described this in great detail in his book *Defensible Space*, in which he argued that high crime rates resulted from design forms. He compared two residential sites: firstly Van Dyck Houses, designed by Isadore and Zachary Rosenfield (Figure 2-2), which was a fourteen-storey high-rise residential area; the other was Brownsville, a low-rise residential area with 23 percent of coverage, compared to the 16.6 percent of the Van Dyck Houses. The crime rate of Brownsville was much lower than that of the Van Dyck Houses, therefore, Newman argued that it was the height of the building that had led to a high frequency of crime. This opinion is questionable (Plunz, 1990). Some restored new high-rise flats show the opposite result, that residents and their attitude, is the critical

element in determining the crime levels in these buildings. In some middle-class, high-rise residential areas, for example, the crime rates are quite low.

The study of these social problems inevitably, has led to a discussion about the



Figure 2-2: Photo of Brownsville Houses public housing project in Brooklyn, with Van Dych Houses behind (Source: Plunz, pp.273)

physical environment. Yancey (1971), in his study on the Pruitt-Igoe high-rise project, found that the lack of opportunity for social interaction created by the layout of their new neighbourhood decreased residents' chances of getting in touch with each other. As a result, it was the shortcomings of the physical environment

which had led to the lack of social interaction, resulting in a series of problems not only about the cold face of the neighbourhood but also the high crime rate. The shortage of public space where residents could meet may also have led to an environment that encouraged vandalism and crime. The final demolition was as a result of these problems.

Though these studies focused on the architectural environment, researchers noticed the importance of public spaces. They believed that "the outdoor environment can compensate for the weaknesses of planning and of architectural design, to some extent, and improve the quality of life, guiding it in a more positive direction" (Plunz. p303).

As a result, in the 1960s, the chairman of the Housing and Development Administration (HDA) of the USA, Mayor John Lindsay, was very aware of the criticism of high-rise residential areas and he commissioned Lawrence Halprin to study the redevelopment of open space within tower housing projects in an attempt to correct some of the design problems of the previous generation. Halprin's work can be seen as an early stage study of the outdoor environment of high-rise flats.

Further, ideas about community garden design was changed by the 1980s, when the concept became more accepted, even somewhat mainstream, with additional sites being developed at hospitals, workplaces, schools, public parks, and elsewhere (Francis, 2003).

Summary: Effects of the outdoor environment within community

1) A high quality outdoor environment positively affects users' physical and psychological health.

A nearby green environment in a residential area affords people access to nature and can improve their frequency of use and satisfaction level (Kaplan, 1985; Gehl, 1987; Lenthe, 2005; Ward Thompson, 2004). In crowded urban space, a green environment affords people sensory relief. When they are stressed or depressed, people often choose to visit natural outdoor settings (Cooper-Marcus, 1995). Even when people have only visual contact with nature and plants, this can also result in important health benefits (Kaplan & Kaplan, 1990). These studies have shown the importance of landscape design, in terms of improving health, and the need for it to be integrated into urban environments.

2) Landscaping in inner-city neighbourhoods may serve to decrease social problems, such as levels of graffiti, vandalism, and perhaps even crime. The physical planning theory of Crime Prevention through Environmental Design (CPTED) advocates that both the fear of and the opportunity for crime may be reduced by proper design and the use of built environment spaces, thereby increasing levels of natural surveillance; greening might also help to deter crime (Kuo, et.al 1998). Yancey's (1971), work on the now defunct Pruitt-Igoe housing projects in St. Louis, USA points to the role that shared spaces play in providing community members with opportunities for social interaction. If there were more shared spaces and semi-private space for residents, people might look after the environment themselves (Lang, 1974). The lack of open space ultimately can lead to high rates of vandalism and crime and a low sense of community.

3) Accessible outdoor environments can minimise socio-cultural problems. The

Hull House community park in Chicago (designed by Adams), for example, served three ethnic communities at the same time. The spending of time together, user groups and types of use intensified the connections among the users of the three communities (Kornblum, 1979, p.16). Residents thereby built mutual trust and confidence beyond the borders of their own social and cultural groups.

4) An increase in property values. A high quality outdoor environment can enhance the price of flats (Leinberger & Berens, 1998, p.25). Chinese real estate developers try to increase their profits by building high quality environments. Although there is no obvious correlation between the price/unit of flats and the quality of the outdoor environment (Zhang, 2006), the fact that people favour a high quality outdoor environment cannot be ignored.

2.2 Relevant studies and discourses

The community garden shares some common points with city parks (Jacobs, 1961, p100). It is a public space which is located in a residential area and it functions as a conduit for social life (Carr,1992).

The CCG which is at the centre of the outdoor environment in high-rise flat residential areas (HRFRAs), provides an outdoor 'lounge' for residents. By visiting the CCG, residents enjoy and interact with nature and have more chances to establish social ties with other people. A number of studies (such as Gehl 1987, Coley 1997) on the outdoor environment have shown that this is the case. Although there have been few studies on the outdoor environment of HRFRAs, the relevant researches concerned with the openspaces/parks of neighbourhoods have provided the researcher with useful information for his study of the CCG of HRFRAs in China.

However, the range and diversity of these studies is such that summarising their key points is difficult. It results from not only the variety of the place studies which can lack theoretical clarification but also the contents of place studies often overlap. The later also suggests that the focuses of these research programs have tended to be relatively narrow. As a result, the direction of these studies is located toward "the

molecular end of the spectrum rather than the molar one” (Patterson and Williams, 2005).

Landscape studies, on the other hand, are often based on a combination of practice experience, general environment-behaviour principles, and the therapeutic goals that have been established (Rodiek and Fried, 2005). Designers often need to take a holistic point of view, one which encompasses many aspects. A narrow focus should not satisfy the needs of the landscape architect in his/her design practice. In that situation, they often take a synthetic point of view which combines many ideas, to analyse the environment (Bell, personal information, May 2008).

Given that the aim of this study is concerned with design practice in China, most of the studies to which the researcher refers are program researches. A summary of these discourses, taking into account the similarities and the broad issues that these studies reflected, indicated the following:

1) Sense of community is the sense of place

Community can mean different things to different people. Researchers often define a community as inhabited, geographically defined areas where groups of people live who can be identified by common interests, values, culture, etc (Pretty and associates, 2003). In the researcher’s study, he uses the term to mean the gated HRFRAs which have obvious boundaries in Beijing, Hangzhou and Shenzhen.

Some researchers believe that there are some differences between having a sense of community and a sense of place. In their opinion, a sense of community often correlates to home or neighbourhood and this topic has generated environmental psychological studies (Twigger-Ross and Uzzell, 1996), while a sense of place has a broader and not always positive meaning (Wilson and Baldassare, 1996). Although there are differences between a sense of community and a sense of place, Pretty believes a sense of community is a sense of place (Pretty, 2003). The studies of community environments can be regarded as place studies.

2) An outdoor environmental study demands taking an holistic viewpoint of an environment.

The study of place comprises place identity, place attachment, and place dependence. Jorgensen and Stedman (2001) found that place identity and dependence were less synonymous with a sense of place than was place attachment. Place dependence (the degree to which a place is suitable for/or encourages a particular behaviour) is different from the other two aspects in nature and should be studied separately. Further, Jorgensen and Stedman suggested that an overall description of an environment was necessary and, that actual behaviours, as they occurred in particular places, should be studied in terms of people's responses to environmental characteristics.

Özgüner and Kendle (2004) studied the effects of landscape aesthetic on users' attitudes in two parks in Sheffield. They found that both a natural and a designed style can improve people's positive preference levels. However, an individual landscape element that is separated from a reading of the whole environmental context looks out of place. Özgüner's study, like Jorgensen's (2001), called for the study of landscape design based on an understanding of place from a general point of view.

3) Behaviour often is the focus of a study.

The relationship between behaviour and the environment has often been the focus of studies of communities. Plas and Lewis (1996), who investigated the impact of the physical environment on residents' sense of community in a planned neo-traditional community of seaside Florida, argued that the presence of shared open space contributed to an increase in social interactions among residents. In a study of American suburban communities (Kearney, 2006), frequency of use was used as a criterion to check people's degrees of satisfaction and social interaction.

Other researchers focused on the influence of detailed environmental elements on people's activity. Coley et al (1997) studied the relationship between the outdoor environment and residents. Their results showed that the outdoor environment of the high-rise areas which had trees and grass played an important role in encouraging greater use and social interaction. Bonaiuto et al (1999) held the same idea.

Although the relationships between the environment and a sense of place are

complicated, behaviour is often the key point of these studies. Thus, Stokols and Schumaker (1981) advocated that the focus of the environment-people relationships should address on the suitability of an environment in terms of behaviours.

4) Categories of the physical environment in some studies.

Skjaeveland and Garling (1997) advocated that the contents of a physical environment can be categorised into two ways – 1) a functional aspect, which, is based on the affordances (a theory which was put forward by Gibson in 1970s. The author will discuss it in Chapter 3 and 2) the appearance (the aesthetic) of an environment. Both aspects influence residents' behaviours.

Smith et al (1997) studied the quality of a community, based on the affordances of its physical environments. In the Smith et al study, vegetation, facilities and a variety of behaviour settings were most preferred by residents. In terms of different environmental aspects, Smith believed that the aesthetic was different from other aspects of place, with regard to the landscape within a community.

5) Preference is often used in the study of outdoor environment.

Rodiek and Fried (2005) studied the effect of environmental preferences on people's uses of the outdoor environment. In this study, physical features, such as paths, comfort, greenery, views, windows and transitions were identified as the characteristics that encouraged outdoor use. The study results showed that 86.8% of people preferred views that looked out on a natural environment, which was greater than the preference for greenery, at 77.9%. Rodiek and Fried also suggested that it was necessary to use a preference study for different aspects of particular features of the environment.

Ward Thompson et al. (2004) studied a neighbourhood openspace in central Scotland. With assessment of quality of life as the study aim, the researchers analysed the relationship between people's preference for the outdoor environment and their actual use, and they explored the correlation between childhood experience of open space and usage as adults of outdoor environments. The results showed that people's outdoor environmental use correlated to their experience in childhood. The study also found that issues such as neat entrances, clear signage and easy access

could improve people's use of their neighbourhood open spaces.

Kyle et al. (2004) studied the relationship between outdoor environmental use motivation and place attachment, with preference as the basis of the study. Motivation was realised as recreational behaviour in the outdoor environment. Among the outdoor environment's attractions, interaction with a park environment facilitated the development of attachment. The author used the recreational experience preferences (REP) to support his study.

7) The view from windows

Wang and Chien (1999) studied the high-rise building areas and compared the influence of the interior to exterior spaces on people's environmental behaviour. The result showed that the exterior environment had a significant influence on people's social interaction (84% of the total number of respondents). In the study, the author found that the "lack of openspace" in the high-rise building areas was the greatest dissatisfaction, followed by a "lack of public facilities/equipment". Although there were some differences in the satisfaction ratings between the higher-living residents living on the higher floors than those on the lower storeys, the view to openspace was an important factor for all residents. Similar to Wang and Chien (1999), Kaplan and Kaplan (1990) and Kearney (2006) also came to the same conclusion from their results.

Summary:

1) The relationship between the environment and behaviour is often an important issue in place studies. Studies have shown that preference and the experience of users play a key influence on people's outdoor environmental usage (Scott and Canter 1997, Ward Thompson and Aspinall, 2008). Because of the diversity of place studies, it is necessary "to move landscape preference research towards a more structured and coherent model of preference for places" (Hull and Revell, 1989). Jorgensen and Stedman (2001) and Özgüner and Kendle (2004) had the same ideas.

2) The relationship between place characteristics which are found in physical

features and actual use can contribute to the study of landscape design (Ward Thompson et al, 2004; Rodiek and Fried, 2005).

3) People's aesthetic appreciation and detailed functional equipment are often the focus of landscape studies within a community (Skjaeveland and Garling, 1997). Although some researchers have suggested a view connection between the interior and exterior environments (Wang and Chien, 1999; Kearney, 2006), these studies have aimed to evaluate a sense of place rather than residents' actual behaviour and actual uses. No study has yet made the connection between the view to be had from high-rise flats and the actual outdoor environment and behaviour taken together. Even in those studies that have considered high-rise flats (Wang and Chien, 1999), this aspect of study has been neglected. The researcher, however, feels that it is worthy of study in the context-specific environment of Chinese HRFRAs.

4) The relationship between place components and behaviours is transactional, and many researchers take an empirical approach to their studies, one which focuses on the experiences of daily life (Manzo, 2005). This is in contrast to positivistic research, which is characterised by researcher-defined variables, quantitative methods, traditional hypothesis testing, and phenomenological approaches that address the intentional interaction between people and the environment (Jorgensen and Stedman, 2001). Program research, as a fundamental type of place study (compared to paradigms and world views of place studies (Patterson and Williams, 2005)) is needed currently in Chinese landscape design studies, particularly in relation to HRFRAs.

2.3 Outdoor Environmental Design Problems in Relation to High-rise Flat Residential Areas (HRFRAs) in China

1. Neglecting the need of users:

Traditional Chinese landscape design focused on the aesthetic beauty of an environment and this approach influences current design practice. Many designers pay much attention to the aesthetic of CCG neglecting the suitability of environment

to people's daily use.



Figure 2-3: The landscape design of two high-rise residential areas: Does a beautiful design mean a good use of space? (Source: the author, 2001)

This neglect of people's real needs leads to the poor use of the outdoor environment. In some projects, a beautiful scene cannot attract people to use the environment (see Figure 2-3). The reason for the poor use of an outdoor environment "partly resulted from the lack of appropriate landscape design" (Cooper Marcus and Barnes, 1999).

At the same time, the design and construction of the CCGs in China, which occurs before the residents move-in, makes public participation unrealised. The one-sided decision by designers and developers objectively decreases the quality of the environmental design of the CCGs in terms of people's actual use. In Singapore, the HDB report showed that excluding the public from participation in the development high-rise residential areas led to the unclear sense of place and weak involvement of community affairs (Teo and Huang, 1996).

2. The lacks of theoretical supports

Some Chinese scholars have carried out studies on the outdoor environment. For example, Zhu's (2004) study of the outdoor environment in a university campus (residential parts) and urban squares, Xiu's (2004) study of the commercial promenade area in Shanghai and Zhang's (1997) study of the older people's outdoor environmental activities. Zhou (2006) studied scenic beauty estimations of residential areas from an aesthetic point of view through SBE (scenic beauty estimation) and JCL (the law of comparative judgement). The results show that a waterscape is the main factor which influences respondents' evaluation. Positively,

the other important factor is the ratio of lawn to hard-surface landscape. The former surface (lawn) is viewed more positively in respondents' estimation. Zhou points out that it is difficult to connect a single element with the quality of the whole environment. SBE is designed for use in forestry evaluation, its application to residential areas creates many problems. Further, Zhou (2006) pointed out that following the existing research methods without fully understanding the theory would impede the progress of any research, and Chinese landscape architects need to identify the characteristics that are rooted in the local conditions in China.

Scholars' opinion shows that although researchers have realised the importance of the outdoor environment, studies of the outdoor environment of HRFRAs are relatively rare. The lack of systematic theoretical frames of reference and detailed studies are the dilemma for any researcher Chinese HRFRAs.

Summary:

The characteristics of the Chinese CCG and the current situation in relation to the current body of knowledge need to ensure that any pre-design study keeps the HRFRAs' users in mind.

The characteristics of the CCG of HRFRAs and China's actual situations means that any study of the CCG will, inevitably, be different, relatively, from similar studies undertaken in western countries. The research focus of the outdoor environment of low rise, low density projects are different from the focus of a study of high-rise flats. At the same time, the ownership of the Chinese CCG and its pre-constructed environment (most community gardens are built before the residents move in) excludes public participation.

These differences have led to a result where the research findings from developed countries might not be appropriate to the Chinese situation. Although many researchers have undertaken studies on the outdoor environment, these studies cannot resolve the problems faced by many Chinese landscape architects.

The studies on the community and outdoor environment of the neighbourhood

indicated that the study of landscape needs a holistic point of view to be taken. Place as a combination of physical attributes, activity and concept of the environment (Canter, 1977) offers a general framework against which to understand the content of the environment. Many recent discourses which have focused on place dependence and which have pursued the suitability of the environment for actual uses are particular focuses of place studies. Of these studies, preference and behaviour are the important issues of landscape studies (Hartig 2006, Clark and Uzzells 2002).

In China, environmental behaviour studies affect the formation of high-rise building areas (Wang and Chien, 1999). The characteristics of and problems reflected in Chinese landscape design are such that human-centred design, underpinned by environmental psychology theories, would be a good basis for studies of the CCG. With place theory as the foundation of the author's study, the next chapter discusses the theoretical framework and the study aim from the viewpoint of the landscape architect.

Chapter 2. Research Approach and Theoretical Framework

Part Two: An Approach to Human-centred Design of the Central Community Garden in China

Landscapes should meet users' diverse and changing needs and respond to their changing situations, relatively few studies have been conducted on the design of community gardens for clients like themselves. In fact, the design of community gardens is still a relatively new attitude. However, the attitude of landscape designers has been changing over the years, and the growing importance of the role of landscape designers in the design of community gardens is becoming increasingly apparent. The design of community gardens is a complex task that requires a deep understanding of the needs and desires of the community, as well as a strong knowledge of landscape design principles and practices. This research aims to explore the design of community gardens in China, with a focus on the role of landscape designers in the process. The research will investigate the design of community gardens in China, with a focus on the role of landscape designers in the process. The research will investigate the design of community gardens in China, with a focus on the role of landscape designers in the process.

This research aims to explore the design of community gardens in China, with a focus on the role of landscape designers in the process. The research will investigate the design of community gardens in China, with a focus on the role of landscape designers in the process. The research will investigate the design of community gardens in China, with a focus on the role of landscape designers in the process. The research will investigate the design of community gardens in China, with a focus on the role of landscape designers in the process.

(1) To profile the preferred garden environment of the community garden users.

(2) To identify the environmental factors that influence the design of community gardens.

(3) To explore the role of landscape designers in the design of community gardens.

(4) To propose a design approach for the design of community gardens.

(5) To provide a framework for the design of community gardens.

(6) To provide a framework for the design of community gardens.

(7) To provide a framework for the design of community gardens.

(8) To provide a framework for the design of community gardens.

(9) To provide a framework for the design of community gardens.

(10) To provide a framework for the design of community gardens.

Chapter 3: Research Aim and Theoretical Framework

3.1 Research Aims and the Theoretical Framework

3.1.1 Aims of the Research:

The design of landscape that takes account of human behaviour requires that the landscape should meet users' physiological, social, and psychological needs. In many situations, relatively few problems arise if landscape architects design environment for clients like themselves - that is for people with similar needs, values, and attitudes. However, the probability of meeting needs in this way declines with the growing heterogeneity of client groups and as people's needs change from those related to shelter and security toward higher-order needs of self-esteem and self-actualization.

This research aims to deepen our understanding of the Chinese CCG as a structured and coherent place via public input by focusing on the relationship between the actual use and residents' preferred environmental elements. A further aim is to improve the design quality of the CCG in HRFRAs. The specific aims are:

- (1) To profile the preferred outdoor environment of the residents of Chinese HRFRAs;
- (2) To identify the environmental elements that influence people's actual uses;
- (3) To compare the significant level of residents' perception of visual impact and functional indicators of people's use;
- (4) To provide a body of evidence that will establish first-hand data for use in Chinese landscape design in relation to HRFRAs;

The results that the author expected were as follows:

- (1) A determination of residents' preferred environmental patterns;
- (2) The provision of a systemic theoretical framework for studying the outdoor

environment of HRFRAs.

(3) The provision of analytical methods for case study and data collection in relation to HRFRAs;

(4) The provision of predictors of actual use and a hierarchy of significant environmental elements in relation to HRFRAs.

The next section will introduce the theoretical framework which supports this study.

3.1.2 The Theoretical Framework

Study Object: The Chinese Central Community Garden in High-rise Flat Residential Areas.

Aim: Behaviour-led human-centred design.

Human-centred design focuses on users' needs, rights and perceptions and is often mentioned by designers (Carr,1992; Francis,2003). The three general criteria (responsive space, demographic space and meaningful space) which Carr (1992) puts forward can support the evaluation of design quality.

The "behaviour-led" aspect alludes to the fact that the emphasis of this study is on people's activities in the landscape. Gehl (1988) claims that it is important to note how the various categories of outdoor activities are influenced by the quality of outdoor space, and in particular how it is precisely the optional, largely recreational functions and social activities that are given a chance to develop where such a quality is improved.

The Link between Theories: Activity.

Although progress in the modern world is fast and brings major change to cities, people's activities in them show a similar continuity (Ward, 1976, p.12).

Given that the correlation between design quality and behaviours happens in the environment, behaviour (and activity) is the main thread which runs through the whole of the researcher's study.

Behaviour links the four theories together, namely: behaviour settings theory, prospect-refuge theory, environmental affordances theory and place theory. Although it has a different function in relation to two parts of the approach, behaviour is the

common point that links together the four theories to create a whole that will lead to the expected research aim, that is an understanding of behaviour-led human-centred design in relation to the CCG of the HRFRAs in China.

In the theoretical framework, behaviour settings theory profiles the general relationship between behaviours and a suitable environment. Behaviour settings have been interpreted by the researcher as “the presence of congruence between topographic and designed features of the setting, on the one hand, and the activities that take place in the setting” (Heft, 2001, p.287). Prospect-refuge theory and environmental affordances theory focused on the different aspects of the physical environments and the possible behaviours that may result. The details of the environment on which these two theories were focused can be seen as the contents of the physical environment in this study.

In the “content” part of the theoretical framework, activity is one of the three components of place which can act as the starting point for a study (Canter, 1977)

The Approach: Environmental Psychology

Jellicoe (1983) argues that landscape design is a projection of the psyche into its natural environment.

1) The function of the four theories in the theoretical framework:

In this research, four environment-related theories have been integrated together in such a way that they present an approach to bridge the gap between the study object and the research aim. These four environment-related theories are as follows:

- a) Canter’s place theory has allowed the contents of the study of the CCGs in HRFRAs to be disaggregated into different aspects, which has reinforced the author’s understanding of the CCGs;
- b) Behaviour settings theory offered a general framework within which the suitability of the different aspects of the CCG environment as a whole could be considered, for some particular behaviours. In this theory, behaviours were a starting point from which the whole study could be organised.
- c) Prospect-refuge theory and environmental affordances theory addressed the composition and detailed elements of the physical environment respectively, in this

study. The two theories detailed the contents of the physical environment and they led these contents in a behavioural direction. For this reason, prospect-refuge theory and environmental affordances theory worked as a filter, whereby it restricted the study's direction and connected Canter's place theory with the research goal.

2) The Personal Construct Psychology offered additional theoretical support for preference. It describes the influences on behaviour from an experiential point of view and in terms of personal choice.

The Context of the Study: Preference

As a particular habitat of human beings in an urban environment, HRFRAs correlate to preference from an evolutionary viewpoint. Studies of the outdoor environment of HRFRAs refer to this idea and treat preference as the context of the study. There are two functions of preference for this study:

1). Preference is considered as the index of motivation (Beck, 1990, p.29), and has significant influence on people. People's behaviour and the choice of the behaviour are influenced by the preference in many situations. "In addition to Darwinian survival-value, we may now also postulate "growth-values." Not only is it good to survive, but it is also good (preferred, chosen, good-for-the-organism) for the person to grow toward full humanness, toward actualisation of his potentialities, toward greater happiness, serenity, peak experiences, toward transcendence, toward richer and more accurate cognition of reality, ect."(Maslow, 1970, p.104). In the study of the outdoor environment with focus on the users, "preference could work as an attitude toward a behaviour that satisfies restoration and other needs" (Hartig & Staats, 2006).

2) Preference offers a criterion for the evaluation of environmental design quality. The result of preference on people's behaviour is expressed as the frequency of the activities (Kaplan, 1982, Hogarth, 1987, Hartig, 2006). Whether or not people visit an environment and how often they use it can be traced from the preference level of the users. Thus, a designer can improve design quality by "examining favoured, valued and preferred places that enables the identification of which environments people utilize" (Clark and Uzzell, 2002).

Figure 3-1 indicates the structure of the theories and how they work together in the study of HRFRAs.

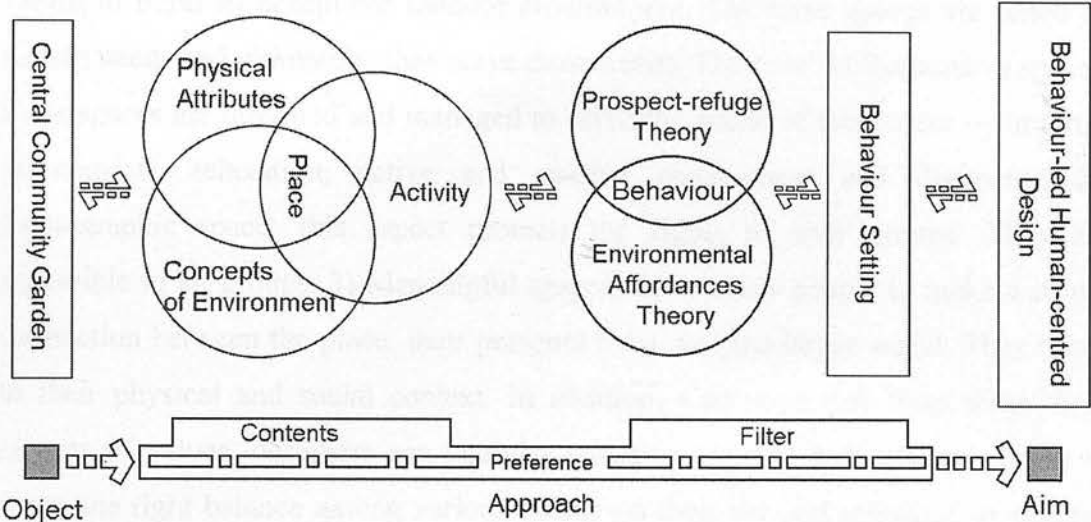


Figure 3-1: The theoretical framework of the thesis

3.2 Human-centred Design and the Central Community Garden

Design quality influences people's daily life. There are many approaches that can be taken to improve landscape design quality. User's needs often are the centre of these studies. As early as 1924, Munford pointed out that if there was no deep understanding of the relationships between human beings and the environment, open space cannot work well.

The landscape, as a combination of functional satisfaction and aesthetic appreciation, has a big influence on people's health and other needs. In design practice, Ji (1631) pointed out over 350 years' ago that neglecting any aspect of these elements could result in the failure of a design. He emphasised that designers were responsible for 70% of design quality.

The design of spaces is not simply a process of organising planes and elements in abstract ways, but it is to enable places to function for people and nature (Dee, 2001, p.35). Many landscape architects and designers who focus on this aim often use the

term “human-centred”.

Carr (1992, p.12) claims that human-centred design can be guided by three primary values to build an acceptable outdoor environment. The three spaces are based on human needs and ultimately, they serve those needs. They are: 1) Responsive spaces: these spaces are designed and managed to serve the needs of their users — in terms of comfort, relaxation, active and passive engagement and discovery; 2). Demographic space: this aspect protects the rights of user groups. They are accessible to all groups; 3) Meaningful spaces: these allow people to make a strong connection between the place, their personal lives, and the larger world. They relate to their physical and social context. In addition, Carr says that from these three aspects of values, designers can analyse, conceive, design, and manage spaces to strike the right balance among various claims on their use and meaning, to manage conflict, and to adjust to changing public life over time.

Through his study of examples of good environments in the USA and abroad, Francis (2003, p.15) describes five qualitative aspects as the criteria for high quality outdoor environments: 1) a high proportion of people in groups use a particular space; 2) a higher than average proportion of women use the space (it means that the space is safe and comfortable); 3) different age groups use the place; 4) varied activities occur simultaneously; 5) more activities involving demonstrations of affection are present, such as smiling, kissing, embracing and holding hands. Actually, all five aspects describe something about behaviours. But there are some differences between them. The first is a summary of their use. The second and third characteristics describe the demographics of users. The fourth and fifth characteristics discuss the activities of users. Although the last activity is more expressive than direct activities, people are showing their liking for these environments.

The aim of human-centred design is to create environments that emerge from what users want and they are for them. Although the ways to evaluate human-centred design qualities are different, Francis and Carr’s descriptions emphasise the need for the expression of a high quality environment and both of them put users at the centre of their study. Their viewpoints and method offer an effective way to study the

environment for designers.

In the author's study, the term 'human-centred' is explored by means of assessing the attitudes of the residents of the high-rise flats in three Chinese cities: Beijing, Shenzhen and Hangzhou. Residents' needs are both the starting point and the ultimate goal at the same time. In human-centred design, design quality is evaluated in terms of its suitability for users' activities and their perceptions of the environment.

3.3 Behaviour Settings and Environmental Affordances

A behaviour setting is an ecological unit which connects a physical environment and behaviour in a particular situation. It is a subspace of a geographical area and the predictable patterns of behaviour it affords (Barker, 1976, p.126).

With seven criteria, Barker (1968) said: (1) A behaviour setting consists of one or more standing patterns of behaviour. A standing pattern of behaviour is a discrete behaviour entity with univocal temporal-spatial coordinates; it is not a characteristic of the particular individuals involved; it is an extra-individual behavioural phenomenon; it has unique characteristics that persist when the participants change. (2) It consists of standing patterns of behaviour-and-milieu. The behaviour patterns of a behaviour setting are attached to particular constellations of non-behaviour phenomena (it could be man-made or have natural features). The milieu is an intricate complex of times, places, and things. The milieu of behaviour setting exists independently of the standing pattern of behaviours and independently of anyone's perception of the setting. (3) The milieu is circumjacent to the behaviour. Circumjacent means surrounding and describes an essential attribute of the milieu of a behaviour setting. (4) The milieu is synomorphic to the behaviour. It describes an essential feature of the relationship between the behaviour and the milieu of a behaviour setting. (5) The behaviour-milieu parts are called synomorphs. We lack a science of things and occurrences that have both physical and behavioural attributes. (6) The synomorphs have a specified degree of interdependence. (7) The synomorphs have a greater degree of interdependence among themselves than with the parts of

other behaviour settings.

Situated behaviour is based on an eco-behavioural approach to the environment (behaviour setting), and emphasises that collective behaviours in a particular environment setting are intrinsically familiar to the character of the milieu. Thus, the milieu of a residential area delineates suitable behaviours, to some degree. Based on this, using suitable behaviours in this milieu to probe the suitable environments, can improve design quality and deepen the satisfaction of residents' satisfaction. Barker (1978, p.194) believed that the pattern of activity within each setting is stable and characteristic...the behaviour of persons who move between behaviour settings conforms to the patterns prevailing in the setting they currently inhabit. He further pointed out that "physical arrangements can enforce some patterns of behaviour and prevent others. The layout of a site, size and distribution of facilities are often important factors in coercing certain features of standing patterns of behaviours and in restricting others" (Barker, 1968, p.29).

These issues, as discussed above, raise three points which researchers should note: 1) A behaviour setting comprises two parts: behaviour patterns and milieu; 2) The focus is the appropriation of behaviour and milieu—synomorph (essential features of the relationship between the environment and behaviour), and is relatively unique for each behaviour setting; 3) The behaviour pattern part of a behaviour setting is restricted by physical forms.

If the function and milieu of the environment are set, the behaviours suitable to this environment are set at the same time (although behaviour settings influence behaviour, they do not usually determine it absolutely). In HRFRAs, both characteristics of the outdoor environment and residents' requirements are limited by the nature of the high-rise residential area. The property of HRFRAs as a habitat influences the function of the Central Community Garden and restricts what are considered to be appropriate for people's behaviours in this environment, to some degree.

Environmental affordance is where "the events demand or invite appropriate behaviours" (Gibson, 1979, p.102), and they are used to examine the relationship

between the functional properties of the environment and how environments are used. "The affordance of the environment is what it offers the animal, what it provides or furnishes either for good or ill" (Gibson, 1979, p.127).

As a surface between the physical environment and the perceiver, affordances link physical environments with direct behaviours through the filter of perception. "Affordance is the possibility for actions afforded to an observer by an object in the environment" (Bruce & Green, 1993).

Affordances, as the medium between perceivers and the environment, focus on functional physical features which the environment or object offers to people in terms of their possible behaviours (Gibson, 1979). The nature of affordances is an interface between the perceiver and the physical environment, where the function of the external environments and an internal understanding meet together.

Generally speaking, affordance is a direct connection between possible behaviours and physical environmental features. Heft (2001, p.287) pointed out that: "the concept of affordance most basically highlights the congruence between structural features of the environment and functional possibilities for the perceiver. Environmental features are experienced as having a functional meaning for the individual. The features afford some action or extend some potential functional consequence."

Summary:

A behaviour setting consists of the environmental characteristics that are suitable for specific activities. Affordances can be understood as a subgroup of a behaviour setting, which includes more contents. There are two differences between behaviour settings and environmental affordances, which can be described as:

- 1) Different scopes: Compared to the contents which behaviour setting mentions, the scope of environmental affordances is relatively small. Behaviour settings include more social limits than the physical environment which environmental affordances contain;
- 2) There exist different relationships between the behaviour and environments in these two theories: The behaviour setting can exist relatively independently of

behaviour which is carried out among it, while affordances of the environment correlates to behaviour intensely.

The similarities between them are:

- 1) Both behaviour settings and affordances focus on the behaviours which an environment offers to perceivers;
- 2) Both theories emphasise the suitability between the environment and behaviours.

The significance of behaviour settings theory for this study is as follows:

Behaviour setting theory and environmental affordances theories are important in relation to the design of CCGs. In HRFRA, the milieu of the Central Community Garden is fixed by the nature of the residential area. The researcher argues that the meaning of behaviour settings can be explained in three ways:

Firstly, behaviour setting offers a way to explore the relationships between behaviours, participants and environments that suit them, and provides a theoretical means to disaggregate their functional parts, thus providing a key structural component and a unit of analysis for the interpretation of findings (Moore and Cosco, 2007).

In terms of integrity, the contents of behaviour setting theory are similar to the contents of place theory. The difference is that place theory does not treat activity as the leading point of study as behaviour settings theory does.

With activity as the starting point, behaviour setting theory orders the sequence of place components through a probe of the suitable environments for these activities, from subjective and physical aspects. In this way, behaviour setting theory and the other two theories channel the study of the CCG towards this study's aim of behaviour-led human-centred design.

Secondly, behaviour setting theory establishes a connection between an abstract design quality indicator — frequency of use, with the contents of place. The conduciveness of an environment to certain behaviours leads to the phenomenon that the same behaviour is repeated again and again (settings are "...a particular place in which specific individuals share recurring patterns of activity and experience"

(Stokols and Shumaker, 1981, p.49). In this way, behaviour setting theory offers a straightforward way to connect abstract use frequency to a relevant environment.

Thirdly, the relationship between behaviour setting and environmental affordances details the hierarchy of environmental use from macro to the micro-level. In this way, environmental affordances which focus on the physical aspect of the environment act as the subgroups of the behaviour settings.

3.4 Prospect-Refuge Theory and Environmental Affordances

3.4.1 The Commonalities between Prospect-Refuge and Environmental Affordances Theory

Appleton (1996) developed prospect-refuge theory in his book *The Experience of Landscape*. He explained the range of possible behaviours in the natural landscape which a preference-based environmental aesthetic might cause. Prospect (to do with perceiving, with obtaining information, particularly visual information); Refuge (hiding, sheltering or seeking protection); the concept of hazard (the proximity of something that threatens, menaces, or disturbs our equilibrium) are three key components with which people make sense of the environment in Appleton's theory. Based on preference, people choose their behaviour or make decisions according to the symbols that appear in the visual panorama. Hudspeth's (1982) case study examined citizens' reactions to different kinds of waterfront public spaces and showed that visual preference can be an effective tool for facilitating citizens' participative activity.

In practice, there are some common points between these two theories, given that they focus on the same relationship:

- 1) Both theories try to explain the influence of the physical environment on people's perception through a visual effect; in prospect-refuge (P-R) theory, it is the panorama or vista. In affordances, it is the objects which people see in the physical environment.
- 2) Both theories emphasise the behaviours afforded by the physical environment.

“Gibson’s theory enables the functional properties of the environment and the psychological/behaviour responses to the environment to be examined together” (Clark and Uzzell, 2002). Appleton (1996, p.151) stated that “the probability that seeing and hiding can, under certain circumstances, have a practical value is consistent with our enjoying an experience of landscape which affords the opportunity to engage in these activities”. The possibility of refuge behaviour in prospect-refuge theory results from the evaluation of the physical environment. Landscapes that enable prospect while providing refuge, are considered very important (Dee, 2001, p.19).

3.4.2 The Differences between Prospect-Refuge and Environmental Affordances

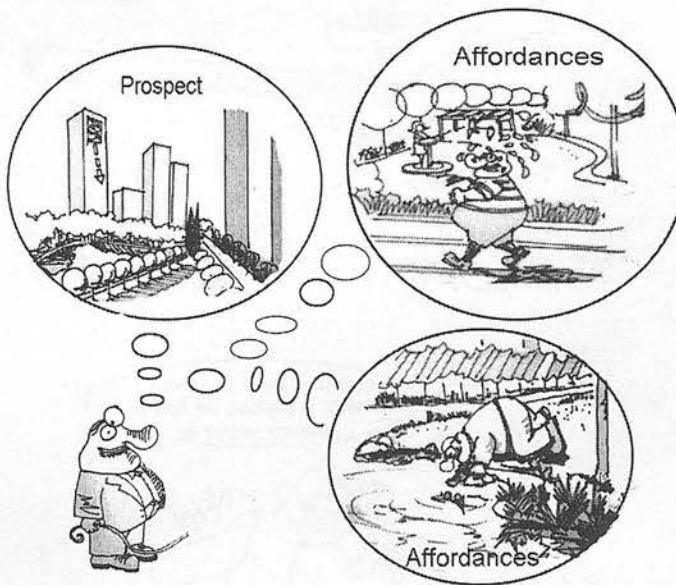


Figure 3-2: What differences are there between the indicators of Prospect and Affordances, in terms of the influences they have on the actual use? (Source: the author, 2007)

Nearby nature is important to the residents of HRFRAs (Wang and Chien, 1997). They appreciate the connection with nature in their daily life. Although many people cannot explain why they like the outdoor environment and nature, they do show a preference for the beauty of it. Other people believe that the functional indicators of the outdoor environment are important to them, especially

for some particular purpose. These purposes include stress relief, sports, to regain their sanity and serenity, or even to enjoy solitude and so on. Talbot (1987) studied the reactions of open-space users and found that the appreciation of the beauty and functional aspects seemed to be different in people’s minds, though Talbot did not see a clear separation between them.

With the difference above in mind, the position of people in the environment often

influences their perception and behaviours. Appleton (1996) discusses the perceptual influence of a panorama on people's behaviour, as an observer in prospect-refuge theory. Appleton thought that "to see" from a high level should be separated from eye-level information (Appleton, personal information, March 2007). Gibson's environmental affordances theory probed the relationships that exist between the physical environment and direct activities, when people take on the role of a participant at eye-level. Studies seldom put the two aspects together. This study of Chinese HRFRAs provided the opportunity to combine these aspects, which are studied separately in many studies (Figure 3-2).



Figure 3-3: Differences between the function and aesthetic on people's behaviours (Source: the author, 2007)

In detail, this difference reflected in the situation of the HRFRAs' outdoor environment, consists of the constituents of the CCG and the panorama. The different positions imply the different roles which people take. In P-R theory, participants often get the panorama of the environment as an observer. In contrast, the perceiver of environmental affordances often acts as the participant in the environment rather than an observer. Heft (2007, personal information) also believes that affordance is different from an aesthetic, where observers admire something at a distance.

The difference between prospect-refuge theory and environmental affordance theory can be summed up as follows:

- 1) Different contents of the focus: prospect-refuge theory often focuses on the aesthetic aspect of the physical features (Appleton, personal information, March, 2007); while affordances are neither subjective nor objective, they focus on the actual function of the environment. An aesthetic of the appearance and an affordance are different in nature (Heft, personal information, September 2007)
- 2) Different time span (Figure 3-3): An aesthetic reaction results from the assessment of the environmental compatibility that satisfies human beings' needs and purposes. Preference as an expression of human needs is often indicated as a "direct, immediate and holistic" (Kaplan and Kaplan, 1987, p.10) feeling. Because the preference judgement which leads to the relevant behaviours in normal circumstances is often made swiftly and immediately, the time which the aesthetic reaction takes to have an effect on guiding people's behaviour is longer than the functions or preferences which are intimately tied directly to human needs and behaviours (Kaplan and Kaplan, 1987, p.10). Thus the time taken for an aesthetic to have an effect on people's behaviours is longer than that of functions or preferences.
- 3) Different roles: the perceiver in prospect-refuge theory often acts as an observer of the environment. The perceiver of environmental affordances is a participant in the environment. This difference also implies the different positions where people are seeing things from—at a high level or eye level.

Summary:

The commonalities and differences above indicate that both affordances and prospect-refuge lead to possible behaviours which result from a personal explanation of the physical features of an environment in different situations.

However, the physical features to which the two theories refer might be perceived differently by people, if P-R and EA theories are addressed. A panorama from a high-level presents the need to take in more information in general more than the environmental elements which people see at eye-level. In this situation, the indicators of the prospect and of affordances which describe different environmental contents, need to be put into different categories of physical attributes.

In the context of the author's study, the prospect indicator means the general

description of the CCG, which is seen in the panorama that observers get when they view the CCG from windows of their homes. The indicator of affordances refers to the environmental elements which the CCG provides for people when they are in it.

On the other hand, an aesthetic response as a reaction to the natural environment is the same as an environmental affordances, but is a different form of expression. Environmental affordance provides a way to measure the relationship between the interior understanding and the actual exterior physical environment.

Appleton (1996, p.151) stated that the aesthetic of an environment partly depended on the intrinsic properties of places (“if the aesthetic enjoyment of landscape is based on behavioural relationships between the observer and his visible environment, it is to be expected that places will be vary in their capacity for stimulating aesthetic response, and that this variation will depend partly on the intrinsic properties of such places”).

In this situation, the aesthetic aspect of an environment can be regarded as an aspect of affordances which focuses on different contents. Thus Hartig and Evans (2003) conclude that “Prospect-Refuge theory is a description of landscape in terms of prospect and refuge affordances, that is, the functional values of landscape.”

Participants of the affordances in an environment react to the environment directly, according to the information reflected in their eyes. Compared to environmental affordances, the aesthetic of an environment, which, in P-R theory, is reflected on the observer in his/her mind, is an integral evaluation of an environment and lags behind the direct reaction towards the environment.

3.5 Place Theory — Understanding the Contents of the Central Community Garden

Canter's (1977) place theory outlines the contents of the environment and states that a sense of place is a combination of “physical attributes, behaviours which occur there, and the concepts of the environment”. The idea is that aggregations of spatial-physical attributes enhance contact in a single locality and constitute an

holistic conception of place (Garling & Golledge, 1989).

In terms of the Central Community Garden, the contents of the environment can also be categorised as Canter's theory described. Factors of place are then disaggregated and the relationships between them are probed through ecological approaches, according to the internal relations of relevant theories.

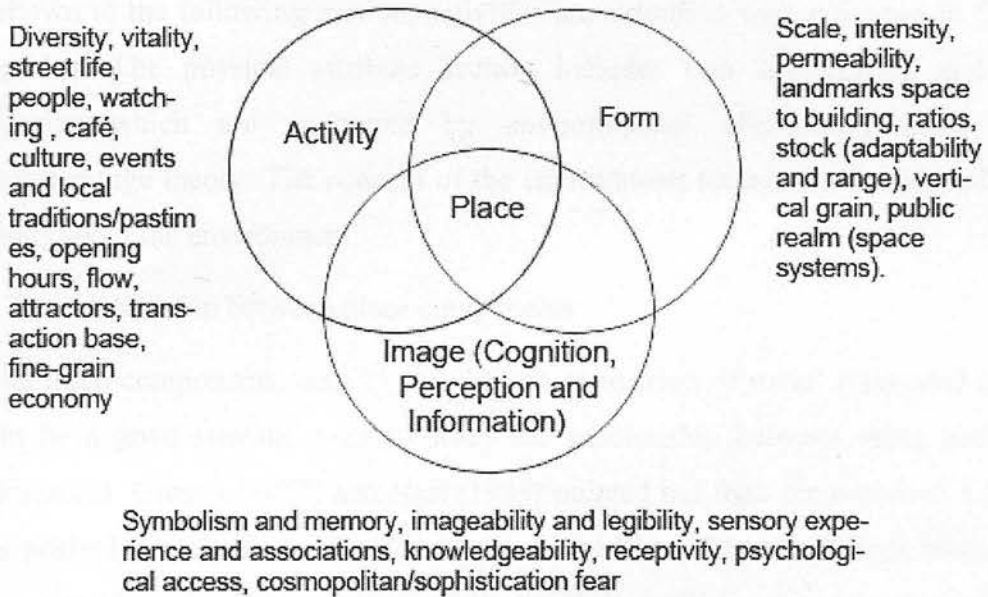


Figure 3-4: The contents of place in Montgomery's (1998) urban design theory (Source: Montgomery, 1998, in Carmona ed. 2003, pp.99)

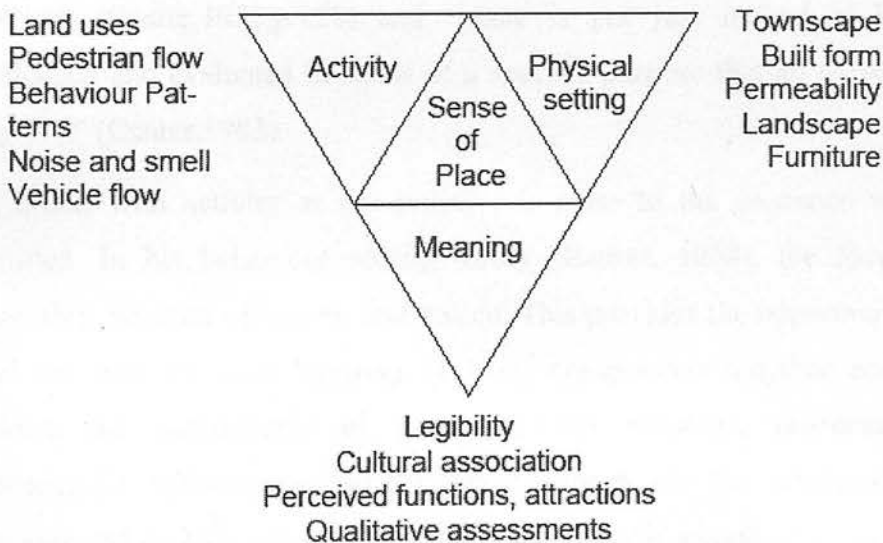


Figure 3-5: The contents of place in Punter's (1991) urban design theory (Source: Montgomery, 1998, in Carmona ed, 2003, p.99)

In practice, researchers often transmit the categories into different contents. Punter and Carmona (1997, p.76) and Montgomery (1998, p93) (see Figure 3-4 and 3-5)

developed their ideas in the urban design field. Diagrams by John Punter (1991) and John Montgomery (1998) illustrate urban design actions that can contribute to a sense of place. Thus, the author's study of the CCG adjusted the contents of the three components to suit the aim and characteristics of the HRFRAs.

1. Constituents of Place Components

As shown in the following section, activities are classified with reference to Gehl's categories. The physical attribute section includes two sub-sections and four categories which are supported by environmental affordances theory and prospect-refuge theory. The concept of the environment focuses on design style and feelings about the environment.

2. The relationship between place components

Of the three components, activity, as a direct expression of users' integrated needs, might be a good starting point to study the relationship between users and their environment. Gibson (1977) and Heft (1988) pointed out that, the nature of a place, is purposively used and evaluated in terms of whether and how it affords behaviours and is not viewed solely in terms of its visual or aesthetic characteristics. Canter himself admits this character of place. "Environmental interactions are ongoing activities" (Canter, 1977, p.128) and "place is not just looked at but normally experienced and evaluated in terms of a specific purpose that an individual has for being in it" (Canter, 1983).

This order, with activity as the priority, is close to the sequence which Barker advocated. In his behaviour setting theory (Barker, 1968), the focus is on the relationship between behaviour and milieu. This provides the opportunity to connect actual use and the understanding of place components together and further, to sequence the components of place. In this situation, prospect-refuge and environmental affordances theories, which focus on the relationship between behaviour and specific physical attributes, work as the second level, after behaviour setting theory, to disaggregate the contents of the physical environment.

In the physical attribute section, prospect-refuge and environmental affordances theories operate as the basic principles that distinguish the properties of the

environmental elements. Physical attributes are put into different categories, according to their nature. Indicators of affordances, as the functional properties of environments related to users, support three functional categories (natural elements, facility, area and safety), while prospect-refuge theory supports one category of perspective.

Concepts of the environment lead to many interpretations. Although the functions of the physical attributes will decide people's appropriate behaviours in the environment, users have some basic expectations of the environment. These expectations can influence people's decision whether or not to get into an environment. They might be viewed, as Punter and Montgomery argued, as image, perception, information or meanings.

Kaplan and Kaplan (1987) state that perception is an aspect independent of the organisation of the environment and its contents. With reference to the experience of the author and the interviews with Chinese residents, they often paid attention to two aspects, feelings and the design styles of the environment. Thus this study uses these two categories to fulfill the requirement of the contents in this section.

3.6 Preference and Actual use

Instinct (from a bio-creature aspect and from social aspects) has an effect on preference. Knopf (1987) reviewed the literature on environmental preference and pointed out that the two different orientations researchers have employed to understand human preference are, firstly, human evolution within the natural environment; secondly, the human socialisation process.

Appleton (1996) believes that preference is often influenced by the instinct and habit accumulated through experience and stored in memory. As two relatively independent aspects of the environment, the author's study of the CCG refers to the preference for biological characteristics as the base that correlates to habitat and restoration behaviours, and he wanted to do some studies to determine on how the physical feature influences performance rather than the social aspects, although he knew that the early social experience of childhood might have some influence on

people's behaviour as adults, according to some studies.

Based on the consideration of experience, Kelly's Psychology of Personal Construct (1955) pointed out that experience can influence the way in which adults behave. The application of PCP theory is such that through the study of personal experience, a researcher can predict possible behaviours in particular environments. Kelly (1955, p.49) pointed out that the function of the network of behaviour or thought which has been built up over time is "leading toward the future". And, the availability of experience, heuristically, leads to a bias in an individual's judgment, leading to further choices and activities which are repeated again and again.

3.6.1 Preference and the CCG of HRFRAs

Darwin (1859), in *The Origin of Species* claims that instinct influences the habit for habitat choice and relevant behaviours, and these behaviours often correlate intensely to preference. "Although the criteria of selection may vary from species to species, the process of selection is always preference based" (Appleton, 1990, p.14).

In their habitats, an animal often makes instinctive use of environments that will ensure the probability of their survival. Animals show a general tendency to prefer and, in so far as they are able, to select an environment which affords opportunities for satisfying all the requirements, peculiar to their spaces in their habitats (Appleton, 1996, p.58). A high-rise residential area is a particular habitat in an urban environment. Among the HRFRAs, it is possible that preference often becomes the dominant attitude which controls people's behaviours and allows subjective appraisals to be made to some degree. The connection between HRFRAs and preference, from a natural selection point of view, offers a general background to the study of the CCG.

Natural selection has ensured the survival of human beings and also identified the intrinsic connection between people and the natural environment. The attractiveness of the natural environment is rooted in the nature of human beings. Wilson (1984) pointed out that people's responses to natural settings was of evolutionary significance, in that modern man innately responded to the characteristics of environments that were favourable to pre-modern humans (quoted by Whitehouse, 2001). The influences of the natural environment on people are represented in

restoration, stress relief and other well-being factors.

These influences work in an automatic way on people's behaviours, as Fazio (1990) pointed out, that the attitudes are assumed to guide behaviour in a spontaneous fashion when people are either not sufficiently motivated to engage in extensive deliberations, or are incapable of doing so. The activities to which Fazio referred are some optional activities with which people often engage in a natural environment. Because the attitude is relatively free, without too much influence of limit or motivation, preference becomes dominant in a "spontaneous fashion", which controls people's nature-related behaviours.

Summary:

Human instinct motivates people to see the natural environment as a way to escape the stress of the urban environment, and to satisfy their need for relaxation and other purposes. As an expressions of human instinct, preference correlates to habitat selection and behaviours with which to approach the natural environment. The CCG of HRFRA which is an environment in a particular urban habitat in China, can be studied via preference.

3.6.2 The Meaning of Preference for a Landscape Study:

Preference offers not only a context for a natural environment study of HRFRA (as was discussed above) but also a way to evaluate the environmental design quality via the actual use of an environment.

In the animal kingdom, it is a given that creatures prefer a suitable environment over an unsuitable one and this pattern might be same for humans as well. In landscape, the perception of the functional meanings of an environment is transformed into the preferences inherent in human nature. Environmental preference reflects the perceptual mechanisms that allow the individual to assess an environment and lead to his/her behaviours, typically, in a rather rapid and automatic manner, whereby he/she assesses whether a particular environment should be approached or avoided (Appleton 1975, Kaplan 1987 1989).

The manner of people's preferences, which can predict the range of their possible behaviours, is important to designers. The predictive effect of preference on

behaviour has been suggested by many researchers. Hogarth (1987, p.62) for example, suggested that people make value judgments by which they express preferences and make predictions that reflect what they expect will happen. People also like to repeat preferred activities every day. Hogarth (1987, p.3) saw that preference as closely linked to the frequency of a person's actions.

Landscape can also be studied through the correlation between preference and behavioural frequency. Gehl (1987, p.131) claims that: "The actual use of the outdoor environment manifests itself as the use frequency and contents of activities". Clark and Uzzells (2002) held the same view and directly pointed out that for residents to maximise their relaxation, the preference of a particular outdoor environment influences the frequency of activities that occur in neighbourhood environments.

However, much of the landscape preference literature has focused on identifying features or qualities which seem to correlate to either preference decisions or to high scenic beauty scores (Herzog, 1985). Most of these studies have focused on the subjective aspect of the mind.

As a consequence, some researchers have turned in this specific direction and have studied the influence of landscape preference on people's behaviour in terms of health and wellbeing (Thompson, et al. 2004; Hartig, 2006).

However, preference has different expressions in different situations. To consider the effect of

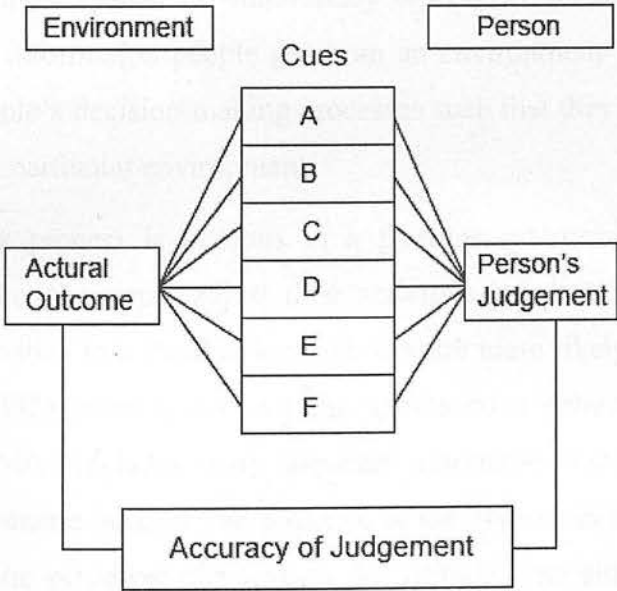


Figure 3-6: Brunswik's lens model at work in human decision-making (Hogarth, R. 1987, p.9)

preference in a particular environment, it is "a systemic idea which fixes the abstract preference into a series of references" (Hull and Revell, 1989).

In a reference system which fixes preference in place study, experience is an important aspect that influences people's perception of place behaviours. Canter (1977, p.1) described place as: "Units of experience within which activities and physical form are amalgamated". In people's daily lives, experience and memory, as the lens between the perceiver and objects, take on important roles which influence preference and activities, and they filter out some things and let other things through. People's perceptions and judgments of the environment are often influenced by their personal characteristics, because what is out 'there' is relayed to our brains through what we see; and what we see depends on the cues 'available' to us (Southwell, 2004). They can allow an individual to 'see' some non-existent things from an existing cue, and, conversely, they can 'neglect' something that is there (Brunswick's Lens Model, Figure 3-6).

In this process, personal experience takes on an important role and simplifies the evaluation process from a series of logically rational assessments to simple preference. Hogarth (1987, p.6) points out that memory reconstructs past experiences and has a big influence on the rules or "tricks" people often use in real life. Preference is often presented as the expression of these "tricks", though it is a complex system in which many aspects are interwoven together. Experience filters the information people get from an environment through preference and simplifies people's decision-making processes such that they feel at ease with their judgements in a particular environment.

This process is obvious in a familiar environment close to people's daily life. Although people adjust their activities to adapt to an external environment, daily activities in a familiar environment are more likely to be spontaneous. Ajzen (1996, p. 392) pointed out that the spontaneous behaviour described in Fazio's model (1990), includes two aspects: automatic-process and controlled process. In automatic-process, the presence of the object can automatically activate the memory of the perceiver and lead to the attitude. The attitude influences the perception or construction of the situation in a positive or negative manner. The outcome is that the attitude influences behaviour towards the object. (If the attitude is too weak to be automatically activated, behaviour is assumed to be determined by non-attitudinal aspects of the situation that happen to be salient at a particular moment.). The

attitudes activated will influence or bias the perception of the situation in an automatic manner.

In the practice of landscape research, Ward Thompson et al. (2004) studied the influence of childhood experience on adults' outdoor behaviours. They found that childhood experience has an influence on adults' outdoor environmental uses. Of the respondents, fifty per cent of those who had used a rural environment as children also used a rural environment as adults, while 90% of those who did not do so as children, who disliked doing so as adults.

Summary:

Preference is highly influential on people's frequency of actual use in a natural environment. The predictive effect of preference on possible behaviours is relevant to designers. They can make use of the predictive effect of preference on behaviour, through the frequency of activities, to explore the influence of design features on residents' actual use, and further to improve design quality.

Early experience in childhood as one of the social aspects influences people's preferences and further, their behaviours. If people established a good, frequent habit of visiting outdoor environments frequently when they were young, they will want to make use of the CCG in the future.

Ward Thompson and Aspinall's ideas have been adopted in this study to see whether the influence of childhood experiences on adults' behaviours exists or does not in the Chinese context. As a fast-developing country, China is experiencing an accelerated process of urbanisation. Each year, a high percentage of rural Chinese residents move to urban areas. Of 120 million migrants to Chinese cities, 99 million come from the countryside. Their childhood experiences influence their behaviour in the new habitat. It is important for designers to understand how significant the influences are from the first-hand data that this study will make available, and to build on the idea of the positive effects that a good environment can have on people's quality of life.

3.7 Co-operation of Design and Research

3.7.1 The Relationship between Design and Research

3.7.1.1 The Differences between Design and Research

The respective properties of design and research account for their differences. There are four distinctions:

1) The different natures:

Research is a creative endeavour. It is a subtle blend of personal skills and order. The order which researchers follow reduces the risk and individual responsibility of research. In comparison to design, research focuses on the nature of a problem and explores the possibility of resolving it. Whether it is successful or not, it can give a clear list of reasons for the result. Or, research can provide a deeper insight into a topic, a better understanding of a problem, clearer opportunities for and constraints on possible action, the measurement of regularities, and ordered descriptions. The aim of research includes three aspects: 1) Developing concepts: characteristics, approaches, preconceptions; 2) Formulating a hypothesis: classifying a hypothesis, an explanatory hypothesis; 3) Empirical testing: observing and sampling.

For designers, empirical knowledge is used to sort out practical problems, are common. Southwell (2006, p.6) believes that the difference between design and research is based on their differing aims – “how things are (‘science’) and a concern with how things could be (design)”.

This difference highlights the point that the designer often focuses on the result and predicts the possibility. This is the reason that Hillier (1990) said that design theory is weak in analysis, as there is too much emphasis on how buildings and environments should be.

2) The different anticipations of the result:

Designers use empirical knowledge to reach an acceptable aim. “The designer works with a set of concepts uniquely geared to the decisions he has to make. Researchers’

concepts are built upon their theoretical orientations, or more particularly, upon the aspects of the situation which they feel they can measure" (Hillier & Hanson, 1990, p.323). Designers know what they do and what result they will obtain. But researchers might be not sure about the final outcome. Whatever the result gained from research, they need to accept it. Thus, for researchers, results are less controllable than for designers.

3) The concepts and methods which are used to describe the problems that are tackled:

Manipulating physical environments, often from a functional aspect, is the focus of designers. On the other hand, a researcher often focuses on the dynamic process of the relationship between human-beings and the environment. Hillier and Hanson (1992, p.281) criticised environmental psychology, saying that this profession was so far from design that it was useless without a connection with practice. They stated: "First, it was argued that that branch of existing academic psychology which was concerned with perception had surprisingly little specific to offer to the field of environmental psychology, although the general scientific approach and viewpoints developed therein had much to commend them. Secondly, those models of man in relation to his physical environment were necessarily complex. We did not anticipate, in the near future, a general model that would explain response, for example, to heat and to landscape in the same terms. Thirdly, environmental psychology is nothing if not applied. It is about actual people in real-world physical environments and is of little value if it can not eventually influence the interaction of people with their surroundings."

4) The language differences which researchers and designers use:

Designers prefer to use vivid expression, which often is represented graphically. Researchers often use abstract descriptions in their work. Kaplan and Kaplan (1989, p.53) generated four perceptions of environmental preference. They are Coherence, Complexity, Legibility and Mystery. These aspects that can be interpreted by designers in another way. Coherence might mean unity, repetition or a continuum, etc. Complexity might mean changes. Any contrast and subdivision of design elements could mean that complexity was changed. Legibility might mean a clear

and simple graphic structure or some remarkable points, such as landmarks. Mystery might correlate to the openness level of a space, and the general control between coherence and complexity could be presented as a rhythm of the changes. In terms of context-specific design, these general interpretations might have unaccountable answers in practice. Designers should decode the message according to the context.

3.7.1.2 The Cooperation of Human-centred Design and Research

Design often studies the suitable relationship through observation of people as opposed to measuring or taking account of users' subjective appraisals. When designers design an environment, "their standards are based on tradition or estimates of average demand rather than any exploration of the subjective preference of residents" (Buttimer, 1972). In practice, even when standards are comprehensive, residents of well-planned estates are not always satisfied (Jacobs, 1961).

This gap suggests that researches which explore the relationship between subjective preference and the actual effects of the environment on people might improve the design quality. In contrast to the observation of the behaviours, preference can provide more information to design. In this way, designers know what users think and what they actually do. Through the relationship between the preference of the environment and the actual behaviour, designers could predict real and possible responses in some common sense rather than everything.

Activity often works as an indicator of environmental uses. Carr (1992, p.248) believes that the design of place has a significant influence on people's perception and activities. It is important then for a designer to predict the responses. Through research, designers can determine the cause-effect or proper relationships between users and the environment. On the other hand, "researchers who work with designers can increase the control they have over testing hypotheses" (Zeisel, 2006, p.48).

The other rationale for the cooperation of design and research practitioners is about the time sequence between research and design. At the inception stage of the design process, which might be more effectively called the conception stage, there has been relatively little attempt to look for psychological input. Hillier (1972, p.331) argued that if research was to make an impact on design, it must influence designers at the

pre-structure and conjectural stages. Thus, researches with clear results can provide information for designers to build their conjecture and analyze the feasibility of the conjecture.

3.7.2 The Influence of Physical Form on Design

The influence of the outdoor environment on people's behaviours consists of many aspects. The physical environment and users influence each other. The general relationship between users and the physical environment is often regarded as a transactional process. Some researchers put the physical environment in first place in this process and, believe that the relationship between human beings and the environment is a fixed one that follows fixed rules. This opinion is popular among functionalists. The functional attribute can be seen as a mechanical procedure, which originates from the physical environment and aims to achieve some specific purposes. Function in design means the 'mechanical part' of a program (Grillo, 1960).

Hillier (1988), on the other hand, explains spatial hierarchy from the angle of social culture. The relationship between human beings and the environment is somehow as mechanical as that of the functionalists. In Hillier's theory, the relationship between man and his environment assumes that man is a passive organism, responding to his environment in a simple and direct way. An appropriate picture is that of man as an adaptive, goal-orientated being. Although Lynch (1981) did not see human beings as passive ones in the environment, he argued that physical form has a bigger influence on people's satisfaction and behaviours than social elements.

Gehl (1987) treats social activities as both necessary and optional ones. They are developed in connection with other people in the same space. Social activities occur spontaneously in the process of two other kinds of activities, the conditions that are better for them and that indirectly support the social one, occur as a way of "affecting the possibilities for meeting, seeing, and hearing people—possibilities that both take on a quality of their own and become important as background and a starting point for other forms of contact" (Gehl, 1987, p.15).

Although the effects of the soft environment on people are important, the physical

environment directly or indirectly works as an inevitable constituent in these studies. Canter (1975, p.181) pointed out the context-specific characteristics of the correlation between people's behaviours and the physical environment. Similarly, so did Heft (2001, p.384), who highlighted the congruence of a good environment and behaviour that "an individual typically chooses to participate in a particular behaviour setting for the sake of some end that is largely intrinsic to the character of that setting". This demands that both physical and social aspects of the environment work together for this purpose. Even the lack of social interaction in the Pruitt-Igoe apartment was rooted, partly in the design of the physical environment. The demolition of it might have been avoided if the physical environment had been improved to enhance possible social interaction.

Physical environments not only affect people's behaviour but also their subjective evaluation of it and their social interactions. Kearney's study (2006) found that where greater attention is paid to physical design it can promote neighbourhood satisfaction. Planning patterns, convenient access to shared outdoor environments (less developed), and some amenities (playground, sports/football fields, etc.) provide opportunities for both interaction with nature and neighbours and help to sustain this goal.

These studies suggest that both the physical environment and social aspects influence people's behaviours. The designer often holds a physical form as his/her dominant idea. Gehl (1987, p.33) pointed out that "physical planning/design could influence patterns of activities, to create better or worse conditions for outdoor events, and to create lively or lifeless cities". Even a quite simple physical alteration can improve the use of the public space noticeably (Whyte, 1980 p.51).

Summary:

This chapter explained the content of the theoretical structure of this study and the relationships between the main theories. With qualitative environmental design as his key aim, the author has taken an environmental psychology approach, linked it to human-centred design and applied it in relation to his study of the CCGs of

HRFRAs.

Of the four theories, place theory is the foundation for this study, in terms of categorising the contents of the outdoor environment. Prospect-refuge, environmental affordances and behaviour setting theories have guided the author to his key research aim and defined the contents on which the physical attributes are focused.

There are two threads running throughout the study framework:

- 1) Preference provides the general context and the criteria by which to evaluate the design quality.
- 2) Behaviour links the four theories and directs the study in a behaviour-led approach.

Analysis in this chapter of the difference between prospect-refuge theory and environmental affordances theory exposed a problem in the design practice of the CCGs in HRFRAs, namely, which aspect is it that is more important for people's actual use, in terms of the prospect indicator and the indicators of affordances?

Although there are many differences between the understanding of the aesthetic and the functional aspect of affordances, the nature of the aesthetic is the same as for affordances (Appleton, 1996; Hartig and Evans, 2003). Thus the aesthetic reflected in prospect-refuge theory and the functional aspects of environmental affordances are not in conflict, when behaviour is the focus of the study. Preference, as an adaptation to the environment which people/animals obtained through evolution, correlates to habitat choice and relevant behaviours. High-rise residential areas constitute a particular habitat in an urban environment that provides preference as a general background to the study of the CCG.

The context-specific environment of the HRFRAs combine high-level and eye-level perspectives of the environment in residents' daily use. This study focuses on the actual descriptions of the environment, which are expressed as indicators of the prospect and affordances, rather than the aesthetic or the functional aspects.

Part Three: The Research Methodology

Introduction:

Francis (2003, p.9) categorised human-centered landscape design research as: “Place-based, issue-based and hypothesis-based study for teaching”. Of these issue-based case studies, they incorporate several cases which show common patterns and themes. Researchers can then review the documents and studies prior to undertaking their study. The interviewees are usually practitioners.

By contrast, a place-based study focuses on some specific places, such as a plaza, square, park, etc. Although a place-based study comprises a document and literature review, participants or residents of a specific place are often the respondents under investigation. Thus the study of the Chinese CCG of HRFRAs in Beijing, Hangzhou and Shenzhen is a high-rise residential area is a place-based study.

To some degree, the reference to environmental psychological theories means that the nature of the study is a cross-cultural one. According to Van de Vijver and Leung (1997), there are four categories in environmental psychological study.

1. Generalisability studies: these studies are concerned with generalising the observation results from one group to other groups (hypothesis-driven, no contextual factors);
2. Theory-driven studies: these studies are concerned with validating a theoretical model which takes into account specific cultural variations. A priori prediction is made and a sampling of the cultures is carefully considered (hypothesis-driven, contextual factors);
3. Psychological differences studies: these are concerned with the application of a measurement instrument in two different cultural settings to identify the differences between the settings, according to the differences in means and standard deviation, etc. No predictions about the nature of the differences are made. Contextual variables are not included and usually, post-hoc explanations are used to interpret the differences (exploratory; no context variables);
4. External validations studies: these studies are concerned with an explanation of the meaning and causes of differences without any a priori hypothesis. A large number of context variables need to be collected, in order to determine which of these

explain better the variations observed in the dependent variable by using statistical techniques, such as regression analysis (exploratory, context variables).

According to the four categories above, the researcher's study has two characteristics. Given the environmental psychological theories already mentioned, the investigation of the CCGs in the HRFRA in Beijing, Hangzhou and Shenzhen is a place-based, theoretically-driven study. If the differences between the three Chinese cities are considered, this study is a place-based, and an assessment of psychological differences was undertaken, thus, the researcher's study is characterized by both theoretically driven and psychological differences.

The methods undertaken were carried out in the following sequences:

- A review of the relevant environmental psychological theories and landscape design theories to construct a theoretical framework;
- A review of the discourses focusing on a community outdoor environment;
- A preference study of the outdoor environment;
- Pilot study
- Questionnaire design;
- City and site selection;
- Data collection;
- Analysis and conclusion;

Of these methods, the questionnaire design was a dynamic procedure with direct links with the pilot study and literature review. The modification of the questionnaire in the second investigation indicated the changes of focus and the emphasis of the study.

Chapter 4: Pilot Study and Questionnaire Design

4.1 Questionnaire Design

4.1.1 Reasons for the Questionnaire and the structure

4.1.1.1 Reasons for the Questionnaire

A survey methodology was selected as the most appropriate data collection method. Observation would have been the most straightforward way to study users' actual use of the outdoor environment of the CCGs in the HRFRAs in the three Chinese cities. Lawson (1997, p.126) argues that design research inevitably has to accommodate the subjective value judgments of users. If a researcher does not acknowledge users' subjective views, he/she is unlikely to obtain a holistic and deep understanding of people's behaviours in a designed landscape. An investigation, based on a questionnaire, can resolve this problem, to a degree.

Human-centred design puts the user of the environment at the centre of the study. With respect to the behaviour, it was directly expressed by the users of the environment might not answer the deep reason which often correlates to the high-level needs. A questionnaire can collect information which is more useful than the observation.

A questionnaire investigation also has weaknesses. Some scholars have argued that a questionnaire study detaches participants from the circumstance under investigation. Some psychologists think that what people say and what they do are often unrelated. Thomas (1971) elaborated on the poor links between attitudes and behaviour. But Fishbein and Ajzen (1974) held the opposite view. They thought that this mismatch was frequently the result of methods of recording attitudes which were abstract and removed from a concern with actual, or likely, behaviours. Rather, they felt that to probe people's inner attitudes which correlate to their behaviours is the more efficient way. Kaiser (2007) provided evidence on the reliance of this connection

according to the results of an investigation that presented a subjective evaluation to account for behaviour with an accuracy of 70-80%.

Considering the huge extent of the topics which place theory covers, the researcher thought that a verbal questionnaire investigation might be the appropriate method for this research. There were three reasons for the choice of this tool:

- 1 . Place theory is the basic construct of this study. It builds on a perception study. So does environmental affordances and prospect-refuge theory. People's deeper perceptions cannot be obtained through direct behavioural observation. Preference for behavioural expression needs some in-depth inquiries. These factors determine that the nature of the study tool.
- 2 . Preference is the context of the researcher's study. Compared to actual behaviour observed in situ, preferences of people's behaviours cannot be obtained from observation only. A questionnaire investigation would be able to tease out more pertinent information in a relatively short time span, compared to observation.
- 3 . The aim of this study was to discover the general opinions which residents held in HRFRA in Beijing, Hangzhou and Shenzhen. The size of the data collection, and site selection, made detailed observation impossible, because it was simply beyond any one individual's ability.

4.1.1.2 The structure of the questionnaire

Space can be divided and categorised in a variety of ways. A researcher requires specific skills to deal with the many different kinds of spaces he/she is likely to encounter, that will involve many different tools to process spatial information, to guide a research investigation and to make decisions. The adoption of the tools which correlates to researchers' background and the aim of the study directly influences the space categorisation.

The choice of appropriate categories for making appraisals depends on the purpose of the assessment, and it is also influenced by the researcher's background. In this

study, the author makes reference to the relevant environmental psychology studies and his own experiences to explore the inner relationship between place components and behaviours for practical purposes.

The whole questionnaire contains four sections: 1) background of the respondents, 2) behavioural section, 3) environmental preference section, and 4) environmental evaluation section.

1) The background of respondents contains some basic information of the participants, such as gender, age, education, etc.

2) The behavioural section focuses on the actual use of the CCG and the experience of the respondents in childhood. This section includes two questions: the frequency of the outdoor environmental use, and the frequency of the outdoor environmental use in childhood.

3) The environmental preference section has three subsections: i) activity, ii) physical attributes, iii) perception and design style section.

The questions about activity (i) emphasise preferred activities, such as “to walk dogs”, “to go for a walk”. The physical attribute subsection (ii) consists of three categories of bird’s-eye view (it focuses on the description of the aerial perspective of the CCG, such as: “the CCG is a garden in geometric pattern”; “the proportion of the natural landscape is greater than the man-made one”, etc.). Questions about the natural elements category refer to elements of the natural environment, such as “a stream or a pond” or “many evergreens”; and questions in the area and safety category ask about the size of the CCG (“a small place which I can walk around in 7 minutes”) and questions on safety elicited responses such as: “I prefer the CCG as a place where cars cannot get through”). The perception and design style subsection (iii) consists of two categories. The perception category includes questions on the feeling of the environment such as “comfort”, “quiet”, etc. The design style category contains some questions asking for comment about: “the design style of the CCG is simple and practical” and “the design style of the CCG is informal”.

4) The judgment importance section focuses on the importance level of the environmental categories which are mentioned above in respondents’ mind. In

contrast to the behavioural section (2) which people actually do in daily life, environmental judgment importance section provided the author with the chance to compare what differences that exist between people's behaviour and their ideal environment. The results of this section will be useful for the real estate developer to help them to identify what people want.

4.1.2 The Questionnaire Design

The author referred to Brislin's (1973) twelve points for a cross-cultural study when writing the questionnaire, namely to: 1) use short, simple sentences in order to minimize the cognitive load of the instrument; 2) employ the active rather than the passive voice; 3) repeat nouns instead of using pronouns; 4) do not use metaphors and colloquialisms, which are not usually easily translated; 5) avoid the subjunctive mode; 6) add sentences when key concepts are communicated. Reword phrases to provide redundancy; 7) Avoid adverbs and prepositions telling where and when , such as 'beyond' and 'upper'; 8) Avoid possessive words where possible; 9) Use specific words such as 'pigs' or 'chicken' rather than general terms such as 'livestock'; 10) Avoid words indicating vagueness, such as 'probably' and 'frequently'; 11) Use wording familiar to translators where possible; 12) Avoid sentence with two different verbs that suggest different actions.

In investigating the language of representation we may have gained some insight into the articulation of other languages of equivalences. "Indeed, the true miracle of the language of art is not that it enables the artist to create the illusion of reality; it is that under the hands of a great master the image becomes translucent. In teaching us to see the visible world afresh, he gives us the illusion of looking into the invisible realms of the minds---if only we know, as Philostratus says, how to use our eyes" (Gombrich, 1960, p.329).

The key point for a researcher is to construct a questionnaire which finds out how transparent, and easily understandable a designer's ideas are from the point of view of the users. The researcher, when constructing a questionnaire, needs to consider that it must serve as an interface between the researcher and the respondents and should be easily understood and explained. People's unfamiliarity with design vocabulary often makes it difficult for them to convey their feelings accurately and

adequately, in response to questions. Likewise, sometimes, underlying agreements and disagreements, likes and dislikes, may be crucial in determining their behavioural choices in an environment and therefore, it is this information that a researcher must try to find out via his/her questionnaire.

These studies give an insight into assessing the content of the CCG. With support from a theoretical framework and relevant studies, the questionnaire is divided into three sections with seven categories.

A further reference to Ward Thompson's (2004) structural question-asking idea supported the researcher's study. Through a simple sentence structure, the meaning of questions was transmitted to the respondents.

The questionnaire, underpinned by the theoretical framework and relevant studies, was designed to assess the content of the CCG as determined by the users. It is divided into three sections with seven categories.

4.1.2.1 Activity Section:

Residents were attracted to the parks for a variety of reasons including for physical activity, enjoyment of nature, social activity, and a sense of relief and escape from an urban setting. The aims of users were expressed by the activities or behaviours in which they engaged once they were there.

For the activities undertaken in a community, Gehl (1987, p.11) categorises them into three groups: necessary activities, optional activities, and social activities.

1) Necessary activities include those that are more or less compulsory—such as going to school or to work, shopping, waiting for a bus or a person. Everyday tasks and pastimes belong to this group. These activities take place throughout the year, under all conditions, and are more or less independent of the exterior environment. There is no choice for participants.

2) Optional activities—those which are participated in if there is a wish to do so and if time and place make it possible — are quite another matter. This category includes such activities as taking a walk to get a breath of fresh air, standing around enjoying life, or sitting and sunbathing. Gehl said that “these activities take place only when

exterior conditions are optimal, when weather and place invite them. This relationship is particularly important in connection with physical planning because most of the recreational activities that are especially pleasant to pursue outdoors are found precisely in this category of activities". So, participants in this category of activities can only make these activities happen if the environment is suitable.

3) Social activities are those that depend on the presence of others in public spaces. They include children at play, greetings and conversations, communal activities of various kinds, and finally — as the most widespread social activity — passive contacts, which is simply seeing and hearing other people".

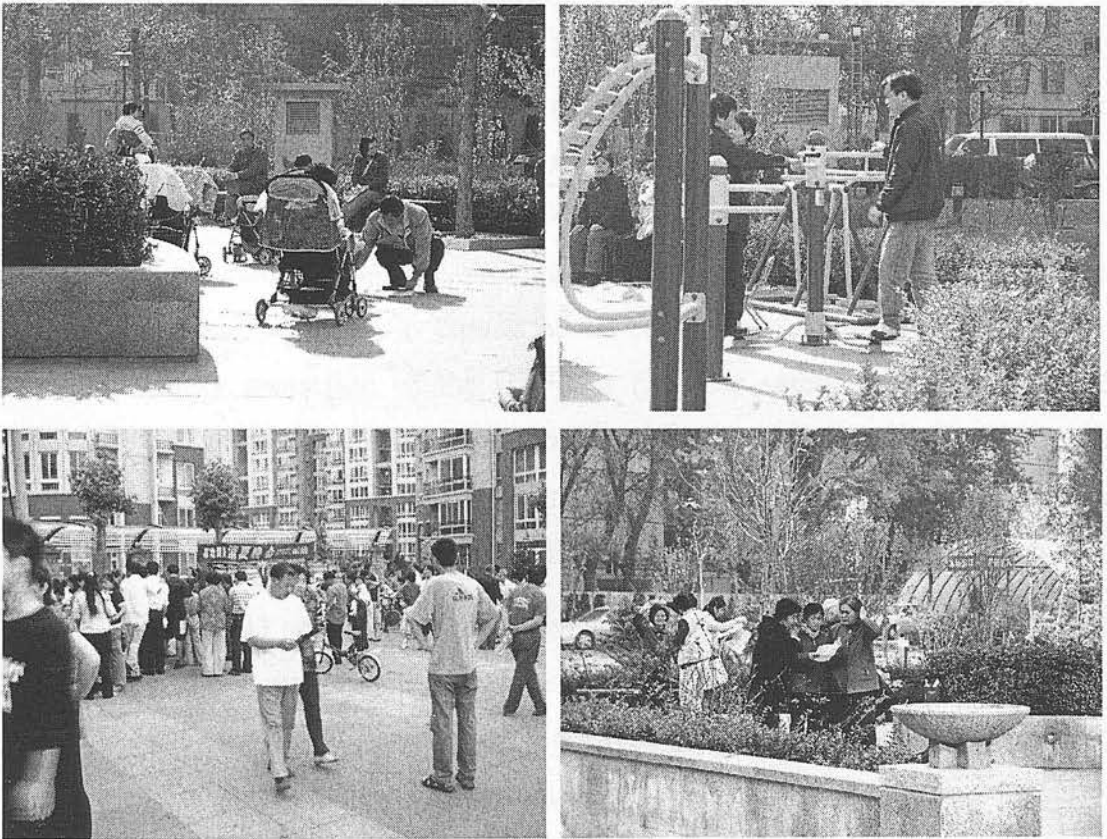


Figure 4-1: Some activities which residents often take in the CCG (Source: the author, 2006)
 Accompanying children (top left); doing some exercises (top right)
 Joining in some events (bottom left); meeting friends (bottom right)

In these activities, social and optional activities are more influenced by the physical environment than necessary activities. A nice environment improves the social and optional activities in this environment. Bonnes and Mannetti (1995) teased out 24 intra-neighbourhood activities according to frequency of use. Among them, a relaxing activity such as going for a walk, playing sports, meeting friends, etc, are

popular. Compared to them, political activity is the most disliked.

The researcher's pilot study, showed that eight activities are often undertaken by residents in HRFRAs. They: "go for a walk", "walk dogs", "accompany children", "approach the natural environment", "meet friends", "take a shortcut", "join some activities" and "do exercises" (Figure 4-1). For teenagers, they prefer roll-skating and ball playing. However, this study focuses on adults, the activities preferred by children and adolescences were taken out.

4.1.2.2 Physical Attributes Section:

This section includes two subgroups consisting of four categories. The two subgroups are a prospect indicator group and an affordances indicator group. Of the four categories, the bird's-eye view category belongs to the prospect indicator group. Natural elements, an area & safety group and a facility group constitute the affordances indicator group. Of these groups, the area & safety group was a composite, which included two aspects of the environmental characteristics. Given that the security protection of the HRFRAs (24-hour safety guard patrol, good lighting, etc), was so good, residents often voiced their concerns about automobile traffic rather than surveillance of their environment, therefore, the contents of the safety aspect were combined with area to build one group, namely, area & safety.

Kaplan (1989, p.41) pointed out that psychological studies on environment fall into two groups: 1) content-based and 2) spatial configurations. The content-based category focuses on the elements of the environment. The spatial configuration emphasises the pattern or the organisation of the environment, the openness level of the space and the spatial definition of the setting (what percentage of the environment is enclosed by the other objects), and so on.

Skjaeveland and. Garling (1997) also categorised the physical environment into appearance and affordances aspects. The aesthetics of appearance and the functional aspect of the affordances are the issues of concern in the author's study.

The studies above show that the categories of the environmental elements' categories can be put into two groups: 1) the visual appearance and 2) details (affordances) of

the environment and that this approach is meaningful for the study of the CCG in the HRFRA.

The physical attribute section includes two subgroups – 1) a prospect indicator subgroup, which is comprised of bird's-eye view variables, and 2) an affordances indicator subgroup, which contains the specific elements of the environment. Prospect-refuge and environmental affordances theories work as the foundation of the two subgroups. (The differences between P-R and EA theories were analysed in Chapter 3.)

1 Bird's-eye view

The view from a window of a high-rise flat is different from the view that will be obtained from other dwelling types. The overlook onto an environment from HRFRA offers general information which is useful for people and influences their behaviours. Appleton (1975) stated: “such places aided survival from animate hazards by offering an observation point to see, to react, and if necessary, to defend” action. Further, Appleton (1996) highlighted the importance of prospect at a high level in the whole decision-making process in his book the *experience of landscape*.

The natural view from a window at a high level has an important influence on residents' behaviour, partly because a “panorama as the expression of visibility gave a significant contribution to people's preference and activities and gave more information than the eye level” (Herzog, 2002). But we do not know what the conditions have to be before residents will be very satisfied and further, what will improve their frequency of use of the outdoor environment.

Researchers have analysed the relationship between people and their view of the physical environment in terms of health and wellbeing. Kaplan (2001) surveyed residents who lived in six residential areas and found that the connection between their home and the natural outdoor environment through windows had a positive influence on the community's satisfaction levels. Although many researchers such as Kuo (1998) studied the influence of a view on the perceptions of respondents, they seldom correlated the view of the environment with behaviour. The view of the outdoor environment in the study focused on the holistic descriptions needed by designers rather than those details.

The fact that the influence of the view from high-rise buildings on people's behaviours should be studied has been supported by Appleton (personal information, March 2007). Fischer and Shrout (2006), Stamps (2007), and Kaplan (2001) and Kearney (2006) also held this opinion.

Heft (2001, p.286) said of the psychological relationship between the structure of the environment and people's perception: "the potential meaning of environmental features is carried in the intrinsic, structural relations in environmental information, and these relations are available in principle to any perceiver". For designers, this potential meaning can be expressed as the composition of the environment. The content of the composition is often understood by people in shapes, colours and the arrangement of the space (Appleton, 1996, p.62). Nasar (1994) held the same opinion and pointed out that structure in the appearance of the environment includes: "Proportion, style and colour".

The other focus of the composition is about the pattern of the structure. Appleton (1996, p.67) stated that there are five ways to achieve aesthetic experiences which prospect-refuge theory describes. Of these, the manner and intensity of the prospects or refuges can be indicated by the extent to which the objects or groups of objects are symbolized. The description of the extent often utilizes the composition of the landscapes which is based on the spatial arrangement — "the spatial arrangement of the symbols is the basis of landscape composition" and, the objects which symbolize prospects or refuges should be "the whole composition". Depending on different requirements, there is "no absolute line of demarcation".

The composition of the environment as an abstract summary is often divided into the informal and geometric. Pattern recognition is important to help us understand and relate to the world around us (Bell, 1997). Geometric patterns and informal design styles often conflict in design. Lang (1987, p.196) thinks that people prefer to see a geometric structure in the visual environment because: "1) the recognition that the structure is in accordance with some canon, or normative principle, is of importance to the viewer; 2) the perception that the structure affords its purpose well; 3) the congruence of the level of its visual complexity and order with the viewer's habituation level or the level to which he or she can adapt; or 4) the maintenance of

the viewer's attention'. This is the logical understanding of the layout of the environment.”

As a result of perceptual learning, logical understanding can help residents to perceive finer details and broaden their appreciation of the environment, although the geometric composition often works as a barrier to users (Francis, 2003). In some situations, geometric composition might have a negative effect on people when design is not rooted in local social and cultural backgrounds. Users may be confused about the strong visual statement with which designers express their ideas (Carr, 1992, p.18). There are many geometric landscape designs in Chinese HRFRAs. But the effect they have on residents is not certain. This study tries to find out its influence of it on residents' actual use.



Figure 4-2: Images of the bird's-eye view of the CCG (Source: the author, 2006)
 With vivid colours (top left) The CCG is in a geometric pattern (top right)
 The CCG is like a forest (with dense plants) (bottom left)
 The proportion of the green landscape is greater than the hard-landscape (bottom right)

The second focus is the proportion of different parts of the environment. Kaplan (1985) found that the role of balance between the built and natural environments could influence residents' preferences. In the outdoor environment of high-rise

residential areas, hard-surface environments often play a big part. Scholars have different ideas about the optimum proportions of natural landscape to hard landscapes. Without investigation, they cannot give a clear answer, therefore in this study, the proportion of natural or soft landscape is included as an item. In the study of HRFRA, 'natural' landscape, as used in this thesis, means the green landscape which consists of vegetation, landforms or ponds, etc. Strictly speaking, almost all the outdoor environments are man-made ones in urban environments. In this context, the term 'natural landscape' is used to distinguish it from those hard landscapes, which are referred to in this thesis as "man-made landscapes", such as squares and constructions, etc.

The third focus is the appearance of the environment: the density of plants. The simple appearance of a big lawn with some tall trees and, the other one where the CCG looks like a forest are two items about the different density of plants and vegetation rather than the relationship between man-made and natural landscapes.

The fourth point is the colour of the CCG. Whether or not residents prefer vivid colours was checked in this study to identify residents' preferences.

In general, the outlook of the outdoor environment in HRFRA is important and the effect on people's actual use needs to be checked with other categories of the environment. The contents of this category include the aesthetical aspects discussed above: proportion, colour and shape. Details of the contents depend on the relevant studies and author's experience. Figure 4-2 provides a diagram of these questions.

2 Natural elements

As a part of ecosystems, plants form habitats for wildlife and people and contribute to biodiversity, particularly in urban areas (Dee, 2001, p.63).

In daily life, natural elements improve residents' well-being and are likely to increase the frequency of outdoor environmental use. Trees and greenery are also considered by most people to be aesthetically as well as psychologically important (Kaplan & Kaplan, 1989). Kahana et al (2006), Kearney (2006), and Henwood (2001) showed the positive influence of natural elements, especially the trees, on residents' satisfaction, attachment and activities. Nelson (2002), Hartig (2003), and Shibata and

Suzuki (2002) also showed that the appearance of natural elements can increase the quality of life.

There are two main categories of plant landscaping: 1) practical and functional placement; 2) Aesthetic arrangements. They often are combined in practice and research. In practice, plants can lessen the shortcomings of an environment. The practical and functional placement of them should be aesthetic, but their use will be for a specific purpose — to define some areas, loosely enclose them and to screen areas as well. Plants are used aesthetically to enhance the overall appearance of a project. They will harmonise with the land and the buildings' (Paul, 1961, p.104).

In human-centred research, Kaplan and Kaplan (1989), Nasar (1994) and Skjaeveland & Gling (1997) think that vegetation provides restorative benefits and can contribute to an aesthetically pleasing environment that may evoke a sense of 'community' and increase the chance for neighbours to interact with others who share similar interests and needs'.



Figure 4-3: Images of the natural elements in the CCG (Source: the author, 2006)
 With a stream or a pool (top left) With natural landforms(top right)
 With many plants (with dense plants) (bottom left) With many evergreens (bottom right)

In an outdoor environmental study, landforms and water features were two other two focuses. Yang and Brown (1992) studied the differences of aesthetic-based preference for natural elements through a cross-cultural study and found that the landform and waterscape can foster a feeling of nature and improve the aesthetic perceptions. Both western tourists and Asian local people preferred the waterscape — a pond or stream, plants and natural landform and a rockery although they liked them in different forms. According to these studies, the natural elements of an outdoor environment can be divided into three categories which a designer can control — landform, waterscape and plants,

Chinese garden design theory often treats “landform”, “waterscape”, “rockery” and “plants” as main natural elements of design. Compared to the other three elements, a “rockery”, as an abstract sculpture does not influence people’s use seriously. The traditional scholar-bureaucrat landscape treats rockery as an important aspect of garden design. This abstract aesthetic is far removed from the ordinary people’s lives. Personal experience suggests that there are few people today who appreciate the beauty of a rockery. Equally, the selection of items for rockery is difficult. There are restrictions in terms of the quality of the stone, shape, size and other aspects that often make a high quality rockery expensive. Thus the rockery is not often used in modern landscape design. So this item was not adopted in this study.

Other elements such as plants, waterscape and landform were asked about in a neutral way to avoid influencing respondents’ answers (Figure 4-3).

3 Area & Safety

Some researchers focus on the size and safety aspects of the outdoor environment. Giles-Corti (2005) studied the relationship between distances and physical activities. They showed that high environmental qualities—a large size and good design can improve the use of an outdoor environment. Skjaeveland and Garling (1997) got the same outcome that spaciousness and the size of an open space were significant to residents’ daily use.

Bardwell (1985, p.300) checked the relationship between the different frequency with which users visited nearby open spaces and the size of the outdoor environment and physical elements. He found that the undeveloped field and pond area in a park

were considered too small by frequent users but were considered to be either of adequate size or too big by residents who used them less frequently.

Compared to other types of open space, the CCG in a HRFRA is adjacent to residential buildings. Residents can get into this outdoor environment easily. Accessibility is not a problem for people, thus the relationship between frequency of use and the size of the CCG is meaningful for designers. But Bardwell and Giles-Corti's studies did not specify what size of open space was suitable for users. For this reason, questions about what size was suitable for HRFRA residents' daily use was asked in this study.

The environmental safety aspect of the CCG focuses on vehicle passage and surveillance of the outdoor environment. Jacobs (1961) and Newman (1973) believe that where there is considerable interaction and surveillance of people in an urban environment, crime levels fall. Madanipour (1996, p.80) agrees with this idea that insecurity is the main reason for the absence of urban life. Surveillance takes on an important role here. This leads to many problems which affect citizens' daily life, and to the ultimate abandonment of some urban neighbourhoods. Interactions among people can reduce crime and vandalism and increase their sense of safety.

Researchers adopt different ways to resolve this problem. Some of them think that defining public and private territories may be helpful for residents to monitor their environment and further to increase their safety (Brown, 1985; Newman, 1973). Others think that criminal activity will decrease and safety will increase if sufficient lighting is provided (Loewen, et al., 1993), and recent research reveals that crime may decrease if an area has sufficient vegetation (Kuo & Sullivan, 2001).

In the CCG, a good lighting system, a 24-hour safety guard patrol and CCTV improve safety. Social interaction among residents might influence their feeling of safety. However, too much interaction may lead in one sense of not feeling safe. This kind of not feeling safe is often expressed as an invasion of privacy, so, whether an environment has too many visitors or not is worthy of further study.

The other issue is vehicle's access. Hanyu (2000) studied the effects of activities and vehicles on people's feelings, and found that it improved residents' sense of safety. This might be because vehicles have two meanings for people. Firstly, vehicles

suggest that the activities of other people can improve surveillance of an environment. On Secondly, cars disturb user activity in an outdoor environment. The movement of a vehicle itself threatens of safety. The author's study checked residents' opinion about vehicle access to the CCGs.

4 Facilities

Facilities play an important role in HRFRA residents' daily lives. A well-designed environment without facilities can decrease residents' daily usage of an environment.

Van Lenthe (2005) studied the relationship between physical inactivity and the mental, physical and safety aspects of an environment. The study found that sports facilities and other facilities in a residential area influenced the physical activities significantly. The more facilities that were accessible to users, the more likely residents would use them frequently.

Given that certain facilities only serve certain activities, user groups have different requirements of facilities (Takahashi and Gaber, 1998).

In a residential area, these facilities are set up in hard surface sites. The conflict between the number of sites which host these facilities needed by users and the lack of spaces can often be a source of argument. Some designers think that if more small squares were put into the CCG, it could satisfy residents' daily needs. Others think that a big hard surface square can satisfy all kinds of use and increase enormously the aesthetic appreciation of the site. Although Kaplan (1980) found that creating a large space was preferred much less than creating a setting with many smaller areas, it is not certain whether a space with many smaller areas is preferred by high-ris HRFRA residents, in terms of actual use. So the researcher investigated this issue. The other focus is the food bar. Carr (1992) and Francis (2003) think that food is important for outdoor environment users. A snack bar is indispensable in terms of providing a sense of comfort which people can get from an outdoor environment. In HRFRA's community garden, this aspect will be investigated to see if residents need this kind of facility.

In total, five kinds of facility were investigated in the HRFRA's. They were: rest facilities-pergolas and pavilions, exercise facilities, multiuse small sites — small

squares, children's playgrounds and food service facilities. These are the five important residential facilities (Figure 4-4).



Figure 4-4: Images of the facilities in the CCG (Source: the author, 2006)
 With many small sites (top left); With pergolas and pavilions (top right)
 With a big children's playground and facilities (with dense plants) (bottom left)
 Exercise facilities (bottom right)

4.1.2.3 The Concept of the Environment Section

Public space carries a diversity of symbolic meanings that evoke emotional responses which stimulate human activities. The concept of the environment is often replaced by some perceptual-related aspects by designers (section 3.5). In this study, perception and design style make up the contents of this section. These two categories focus on understanding people's feelings and their appreciation of the surrounding environments.

Design style often influences people's ideas. "The aesthetic integrates all stimuli which people get in a natural environment into one" (Bell, 1997). From a healthy point of view, a sense/feeling of an aesthetic dimension improves people's

psychological and physical health and behaviour in a far-reaching way (Kaplan, 1989), though over-emphasis on the aesthetic might limit human usage and enjoyment in open space (Francis, 2003, p.13).

Design practice and relevant studies suggested that design style is important for people's perception and utilisation. Özgüner and Kendle (2004) in Sheffield compared a botanic garden and a public park to see how design styles influence users' feelings. They found that users preferred both formal and informal design styles in their daily use. But for relaxing purposes, users are more in favour of an informal one. The CCG, as a part of daily life, is closer to users than a public park. Aesthetic appreciation in residential areas might be different from that in a public area, to a degree. In design practice, the designer and clients often have different ideas about the design styles. Unfortunately, there is no clear answer which can show that any side is totally correct. However, the relationship between having an aesthetic feeling for an environment, and design style questions are included in the author's study. This part includes "grand", "informal", "fashionable and leading", "suitable to the architectural style of the residential buildings" and "simple and practical". "Grand" means a western formal design style which has a symmetrical layout and construction. "Informal" means that the pattern of the layout is contrary to a geometric or symmetrical one. This is a Chinese way to distinguish design styles, usually.

Perception focuses on the senses which residents prefer in a CCG. With human-centred design as the goal, this study focuses on a positive description of the environment. Carr (1992) emphasised comfort, relaxation, active or passive engagement, and discovery in design practice. As the first need, comfort might be physical or mental, or both. It is a general description which can be explained in many ways. Here, comfort works as a perceptual item, emphasising a subjective perception of the outdoor environment. In this point of view, relaxation could be understood as comfort (Cooper Marcus and Barnes, 1999). Active engagement and passive engagement result in different feelings in an outdoor environment. Usually speaking, the image of the environment presented in front of users maybe "vibrant" or "quiet". Kaplan & Kaplan (1989) think that mystery is one of the environmental characteristics that influence people's perceptions and it is often accompanied by the

reaction to discovery. Compared to the contrary aspect of danger (Herzog, 1998), the preference for mystery, with discovery as an aim could be explained as “interesting” in the perception of a place. In this way, the main perceptions of an environment are transferred into design language.

In summary, the questionnaire consisted of 36 items in the main body, as shown in Appendix 2.

4.2 Pilot study:

The pilot study focused on five HRFRAs in Beijing. From 17 October to 5 November, 2005, a total of 687 respondents participated in the survey organised by the author.

These HRFRAs included Taiyue garden (124 respondents), Shanshui garden (119 respondents), Yicheng garden (150 respondents), Yuxin garden (143 respondents) and Fangqun garden (151 respondents). Reader Peiyong Wang and fourth-year landscape architecture students of Beijing Forestry University assisted the author with this pilot study.

The three-part questionnaire included a section on demographics, an environmental preference section and attitudes in response to the actual environment in which the respondents lived. Further self-reported questions about dissatisfactions were asked at the end of the questionnaire.

A principle component analysis (PCA) was carried out to simplify the structure of the data. Researcher used this analysis to summarise the contents of the questionnaire and clarify the differences between these categories. The result of PCA showed that respondents' views of the CCG, and the activities and the environment that they think are suitable. Children's playgrounds and plants were found to be very important for people (Appendix 4-1). Some respondents said that they often joined in public events, they looked after children, enjoyed being in a natural environment or did exercises in CCG.

Although the pilot study obtained some useful information, it also exposed some

problems:

Firstly, the self-reporting section did not get satisfactory results. 43% of respondents neglected this part of the questionnaire. 95% of the questionnaires, where the reason for the respondents' satisfaction levels could be evaluated, were left blank.

Secondly, a property manager interviewed disliked evaluating the environment in which the respondents lived, in case there was any possible conflict between the respondents and the property management office.

Thirdly, the number of the residents who answered is small and the contents of the answers in the self-reporting section of the questionnaire were too simple to get satisfied summarisation. This hindered the focus of the CCG study.

Modifications from the pilot study:

Firstly, the study was changed to focus on the relationship between residents' actual use and the environment rather than an evaluation of the actual environment in which the residents lived, thus avoided arousing the possible conflict between the estate manager and residents.

Secondly, the contents of the questionnaire concentrated on the community garden-related issues. This was in contrast to the contents of the pilot study which covered other areas beyond the CCG.

Thirdly, the modified version detailed the issues of the CCG according to the literature review, and added some contents which were reflected in the pilot study. These included the four popular activities which have been discussed above, the addition of a bird's-eye view (the aerial perspective) category, the addition of perception and the design-style section.

Through these modifications, the contents of the questionnaire in the activity section, physical attribute section and the perception section evaluated a general description of the CCG as a place.

Chapter 5: Sample Selection and Administration of the Survey

5.1 City Selection

5.1.1 The reasons for the cities' selection: Beijing, Hangzhou and Shenzhen



Figure 5-1: The location of Beijing, Hangzhou and Shenzhen

China covers 9,600,000 km². The climate, socio-culture, geographical differences and economic development imbalances between the northern and southern areas have a significant influence on people's living conditions so that the attitudes to the outdoor environment are different in different areas. The researcher's selection of the cities focuses on the relatively economically advanced areas along China's south east coastline. Beijing, Hangzhou and Shenzhen enjoy sound economies. Residents' quality of life is higher, relatively than other areas of China (Figure 5-1).

The geographical locations of the three cities cover a big area of China. Beijing is located on the Bohai estuary, Hangzhou is located on the Hangzhou estuary and

Shenzhen is located on the Zhujiang estuary. In terms of the geographical and cultural differences, Beijing and Hangzhou share more similarities than Shenzhen, which is a city that is located in the southern area of China. The culture in Guangdong province in which Shenzhen is located is called culture of Lingnan (the South of the Five Ridges region). Because of the geographical location, culture of Lingnan has its own characteristics which are evident in its aesthetic, religions, behaviour patterns, foods, etc.

In terms of city types, Hangzhou is different from Beijing and Shenzhen. Hangzhou is a restorative city, famous for its beautiful landscape. Although the economy of Hangzhou is good, its ability to compete economically is weaker than Beijing and Shenzhen. This difference is reflected in Hangzhou's lifestyle and pace of life, which is slower than in the other two cities.

5.1.2 Location, Economy and Socio-cultural Features

Beijing is a municipality directly under the Central Government. As the capital of China, it is the second biggest city after Shanghai. It is located in the north-east part of China (39°54' N. (latitude) and 115°23' (longitude)) at an elevation of 43.5m above sea level. The climate of Beijing is of a continental type, with cold and dry winters and hot summers. January is the coldest month (-4°C), while July is the warmest (26°C); its total area is 16,808 km², stretching 160 kilometres from east to west and over 180 kilometres north to south.

There are clear differences between the four seasons. Normally, it is regarded as being winter when the temperature falls below 10°C; when it is warmer than 22°C, it is regarded as being summer. The days between these extremes are considered spring and autumn. Most of the rainfall is concentrated in summer, especially during July and August. For the rest of the year, Beijing is dry. The average rainfall per year is 700mm but its distribution between seasons is quite unequal; averages per season are spring 585mm, summer 5105mm, autumn 85mm and winter 280mm (website 8).

Beijing has 18 districts and counties. The total population is 15.38 million, not including 3.8 million urban migrants. Of the officially recognised population, 1.8% of its citizens have masters degrees, 11.34% have bachelor degrees, and 11.19% have a college education background. The educational background of the rest of the

residents (75.67%) is limited to secondary school or a lower level. The gender ratio between males and females is 102.5: 100. Of these citizens, the older people comprise 10.7% of the total population. 79% of Beijing citizens are between the ages of 15-64; 10.3% are adolescents or children.

Hangzhou is located in northern Zhejiang province, in the south-east area of China, at the southern end of the Grand Canal of China, on the plain of the mid-lower reaches of the Yangtze River (Cháng Jiāng). The city was founded about 2,200 years ago during the Qin Dynasty. It is listed as one of the seven ancient capitals of China.

The latitude and longitude of Hangzhou are 30°16' and 120°12' respectively. Hangzhou's climate is a humid subtropical one, with four distinctive seasons. The average annual temperature in Hangzhou is 16.2°C (61.2°F). It is warmer than Beijing and colder than Shenzhen. The summers are hot and humid, while winters are relatively cool and dry. In July, the hottest month, the average temperature is approximately 33.8°C (92.8°F); in January the average temperature is 3.6°C (38.5°F). Hangzhou has an average annual rainfall of 1,450 mm. In mid-summer, Hangzhou, along with other cities in Zhejiang province, suffers typhoon storms, but typhoons seldom strike it directly. Generally they make land along the southern coast of Zhejiang, and affect Hangzhou with strong winds and stormy rains.

Just 200 km away is the city of Shanghai--another of China's super-mega cities. It is at the forefront of Chinese economic development.

Shenzhen is located in the southern area of China on ordinates 22°27' N (latitude) and 113°46' E (longitude). It is a young city, established in 1979, at the beginning of China's opening and reform policy. Adjacent to Hong Kong in the south, Shenzhen is famous for its rapid economic development and serves as the window into the new China for the rest of the world.

The one-time fishing village of Shenzhen, singled out by the late Chinese leader Deng Xiaoping, was the first of the Special Economic Zones (SEZ) in China. It was originally established in 1979 due to its proximity to Hong Kong, then a prosperous British colony. The SEZ was created to be an experimental ground of capitalism in "socialism with Chinese characteristics".

The boomtown of Shenzhen is located in the Pearl River delta. The municipality covers an area of 2,020 km² including urban and rural areas, with a population (not including commuters) of 8,277,500, by the end of 2005. Of these, 1,819,300 had legal residence. Shenzhen is a sub-tropical maritime region, with frequent tropical cyclones in summer and early autumn, with an average temperature of 22.4°C year-round (72°F) although daytime temperatures can exceed 35°C. There is no clear difference between the four seasons. Because of its geographical location, Shenzhen has plenty of rainfall, more than 1500mm (website 10).

According to the fifth national population census, the general population of Shenzhen is 1.306 million. The male to female ratio is 97.7:100. The age structure shows that Shenzhen is a young city. Citizens aged from 14-65 years make up 90.39% of the total population; the percentage of elders (older than 65) is only 1.11%. The average age in this city is 25.37; people aged between 20 and 39 make up 66.38% of the total population. (website 11). The percentage of highly educated citizens (bachelor degree and above) citizens in Shenzhen is 5.18% (website 9)

5.2 Site Selection

5.2.1 Criteria for the Site Selection

As a place-based study, the study of the CCG in HRFRAs was restricted by two aspects and six small criteria in terms of the site selection.

The two aspects are the physical criteria and the logistic of being able to manage and administer the environments. With these criteria in mind, six examples from three cities were studied.

The first aspect was the criteria used to select the projects which included six small points: 1) Buildings in the residential areas investigated are all higher than ten storeys. The height of the residential buildings is more than 27m; 2) The pattern of the planning. In these projects, the CCG is in the centre of the residential area and is enclosed by high-rise buildings; 3) The areas of these gardens are bigger than 6,000 m²; 4) The plot ratio should be greater than 1.6; 5) The community is gated. The HRFRA has a clear boundary with its urban context and has a regulated entrance; 6)

The age of the community is more than three years old.

The second aspect is whether the task is manageable or not. This aspect included two sub-items: the permission of the estate manager and the potential of the questionnaire collection to meet the requirement of gathering a sufficient number for statistical analysis.

As already stated, many managers dislike the idea of researchers investigating their project because they are afraid that the investigation will exacerbate any conflict between residents and the management of the project. This difficulty meant that the research had to give up investigating some valuable projects. 'Capability', means that if there were enough residents who were likely to answer the questionnaire. In some luxury apartments, the chances of the researcher meeting people in the outdoor environment were rare. Even if some residents strolled in the CCG, most of them disliked answering questions. Thus the 'capability' was not enough.

With the physical criteria decided, the researcher then got permission from the managers of the six projects.

5.2.2 Sites Studied:

1. Beijing



Figure 5-2: The location of the projects investigated in Beijing

In Beijing, three projects were investigated - HuaQing Garden, DangDai Garden and YiCheng Garden. These residential areas are located in HaiDian district— in the north-west area of Beijing (Figure 5-2).

DangDai Garden was built in 2001 with an area of 210,000 m². 5,327 residents from 2,159 families live in this residential area. The plot ratio is 1.61. HuaQing Garden was built in 2000 with an area of 12.7 ha. The plot ratio is 2.5. YiCheng Garden was built in 2003 with an area of 17.6ha, and a plot ratio 2.38. In total, 6,100 residents from 2,700 families live in this residential area.

Discription of Dandai Garden

Dangdai Garden (Figure 5-3 and Figure 5-4) is an elongated shape which winds through the spaces between the buildings. The designer uses waterscapes to link the different areas together to fit this circumstance. Along the small river, natural landforms and small sites are set. In Dangdai Garden, there is no strong feeling of enclosure, which many HRFRAs have, because the informal water strip breaks up the density of the buildings that are imposed on the CCG and conceals the monotony which the elevations of the high-rise architecture brings.

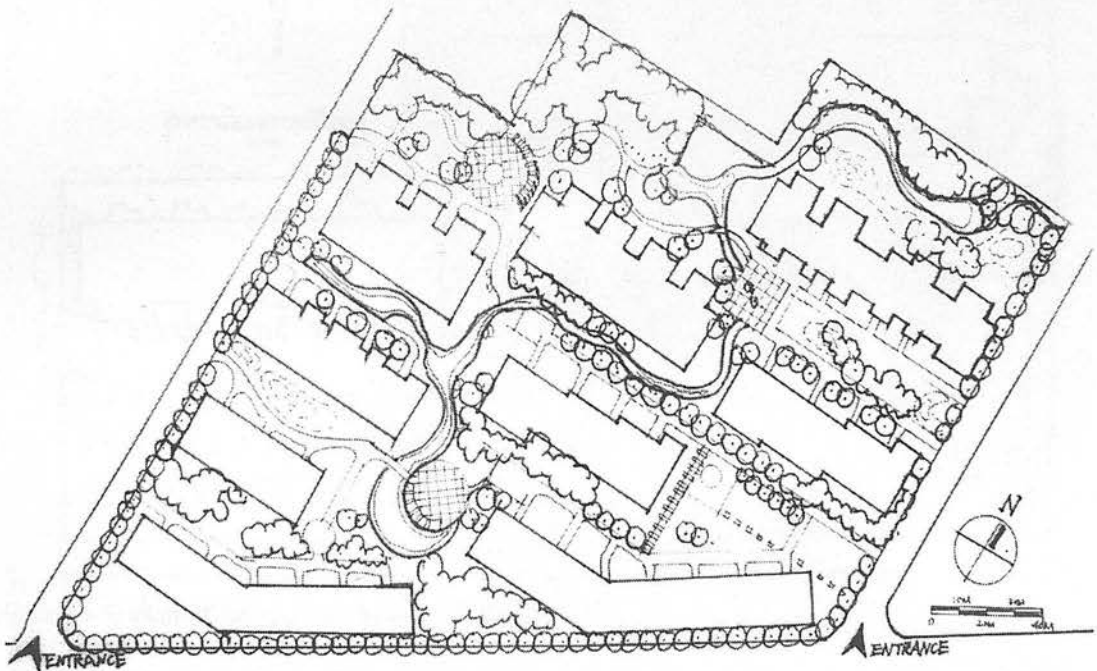


Figure 5-3: Plan of the CCG in Dangdai Garden

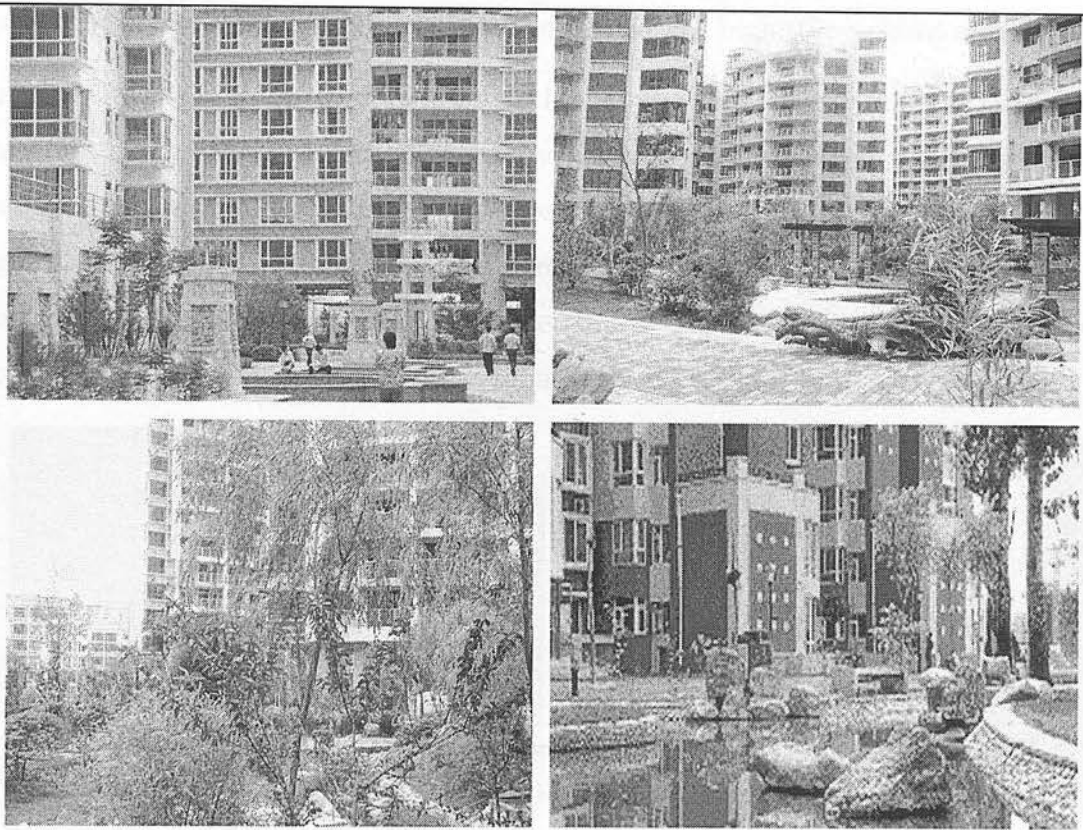


Figure 5-4: Images of Dangdai Garden

Discription of Yicheng Garden

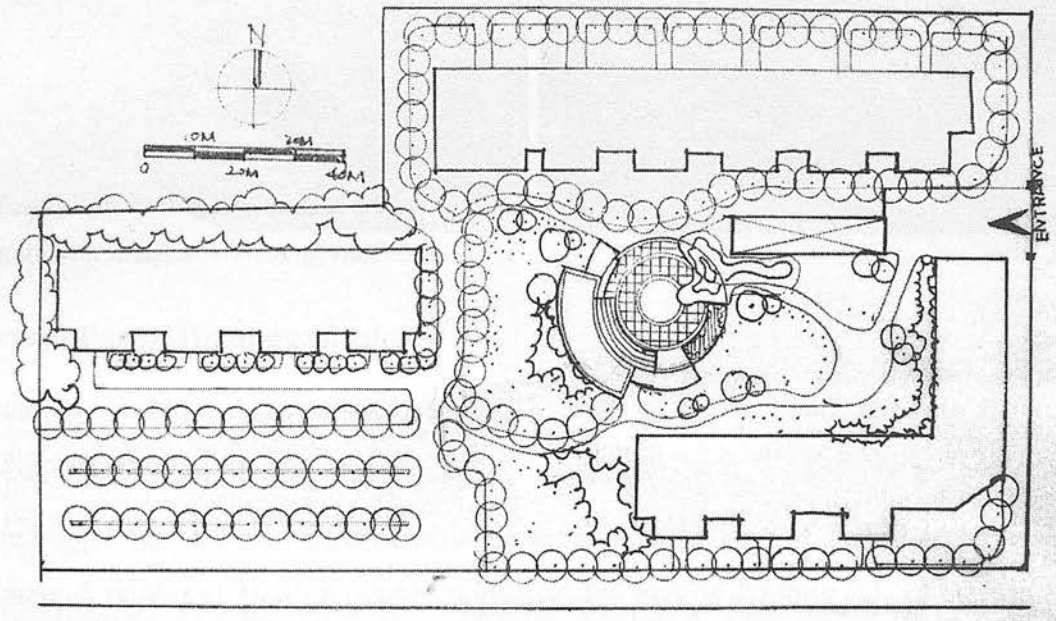


Figure 5-5: Plan of the CCG in Yicheng Garden

Yicheng Garden (Figure 5-5 and Figure 5-6) has a regular geometric design style. It has a big hard surface square and an open space, which makes it look more like a city

square than a space in a residential area, with a flat and highly open lawn area.

However, the designer has used different levels to reduce the emptiness of the space and has divided the big hard surface square into several different smaller parts by using flower beds and shrubs. A children's playground sits at the corner of the garden, which is close to the main square. This juxtaposition seems good because many residents, especially older people, look after children while chatting with each other or they do some exercises in the square.



Figure 5-6: Images of Yicheng Garden

Description of Huaqing Garden

Huaqing Garden (Figure 5-7 and Figure 5-8) consists of two small spaces in different design styles.

The bigger one is a roof garden, which was built on the roof of a semi-underground garage. A pool with small fountains reinforces the axis of the long side of the garden. Some events are held in this part of the CCG. The other space of the garden is simply planned in an informal design style, with pavilions and small sites to give residents an environment for relaxation.

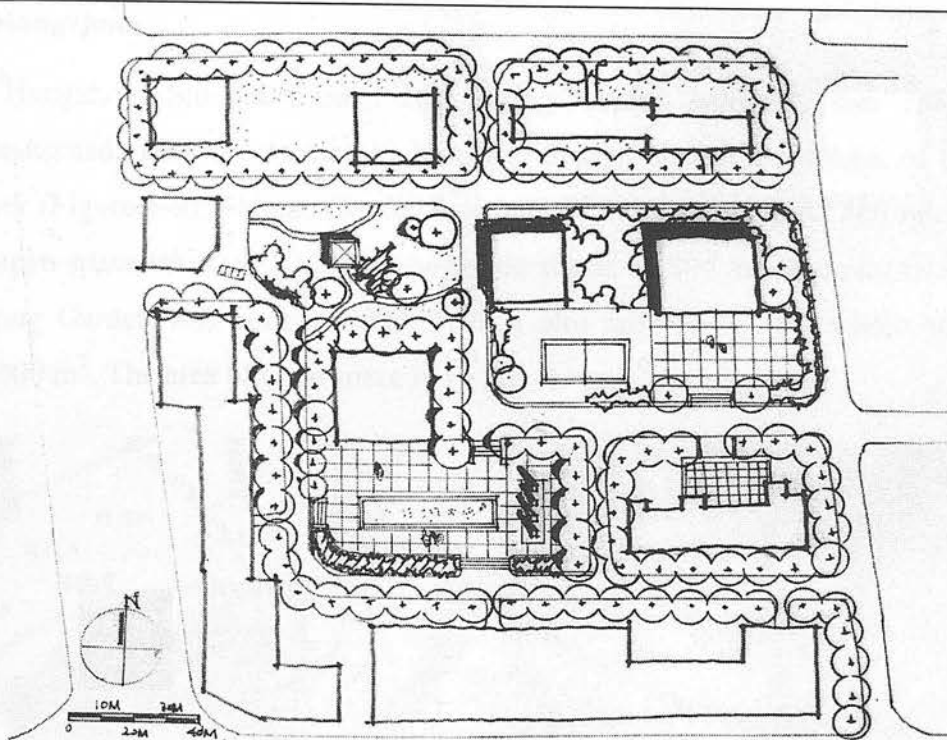


Figure 5-7: Plan of the CCG in Huaqing Garden



Figure 5-8: Images of Huaqing garden

2. Hangzhou

In Hangzhou, Shimao Garden and Jiajing Garden were the two communities investigated. They are located in Xiaoshan district on the south bank of QianTang River (Figure 5-9). Shimao Garden was built in 2003 covering 42,500 m². The area of open space takes up 30.2% of the whole site at 12,800 m². The plot ratio is 4.35. Jiajing Garden was built in 2002. With a plot ratio at 2.7, the whole site covers 53,000 m². The area of open space is 16,500 m².



Figure 5-9: The location of the projects investigated in Hangzhou

Description of Jiajing Garden

Jiajing Garden (Figure 5-10 and Figure 5-11) was designed in an informal style. The whole environment consists of three parts-the entrance square, lawn terrace with pergola, and a space with a totally natural design style.

The designer's idea was to give the viewers a sense of being in an urban space at the entrance to the square, then there is a totally natural one, with a lawn terrace in the middle. In terms of construction details, the designer used curved lines to reduce the impact of the architecture and the straight lines of the space.

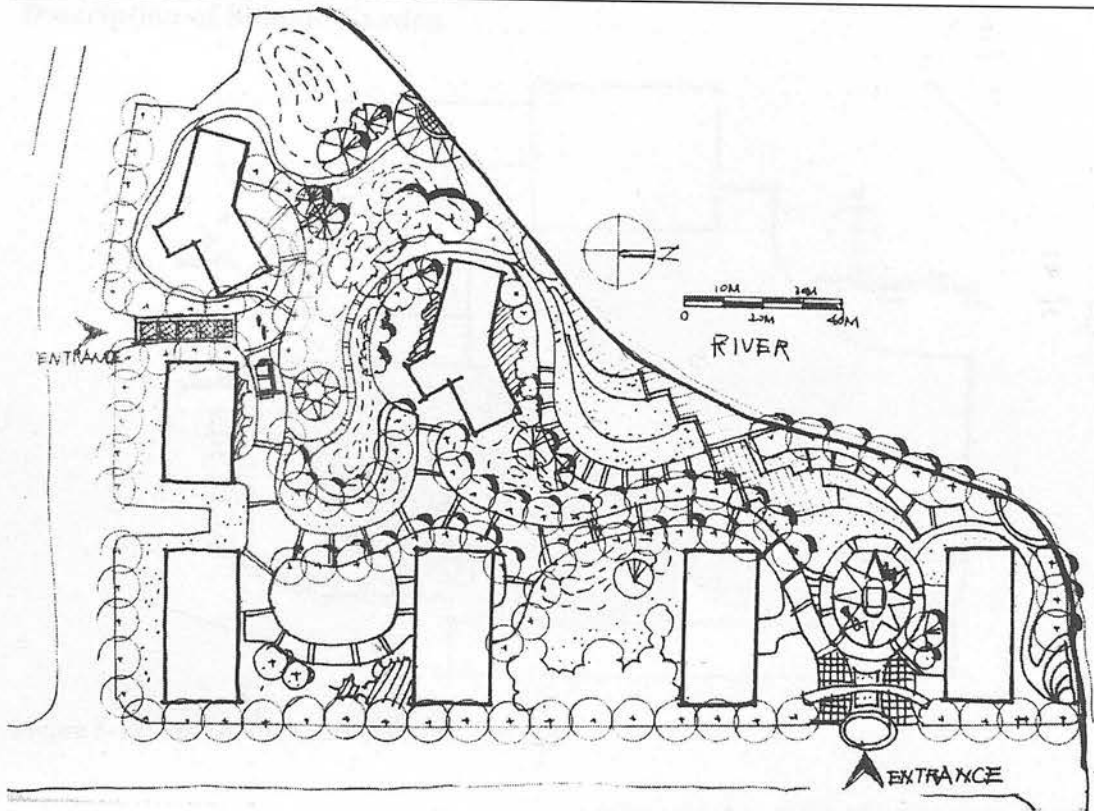


Figure 5-10: Plan of the CCG in Jiajing Garden



Figure 5-11: Images of the Jiajing Garden

Description of Shimao Garden

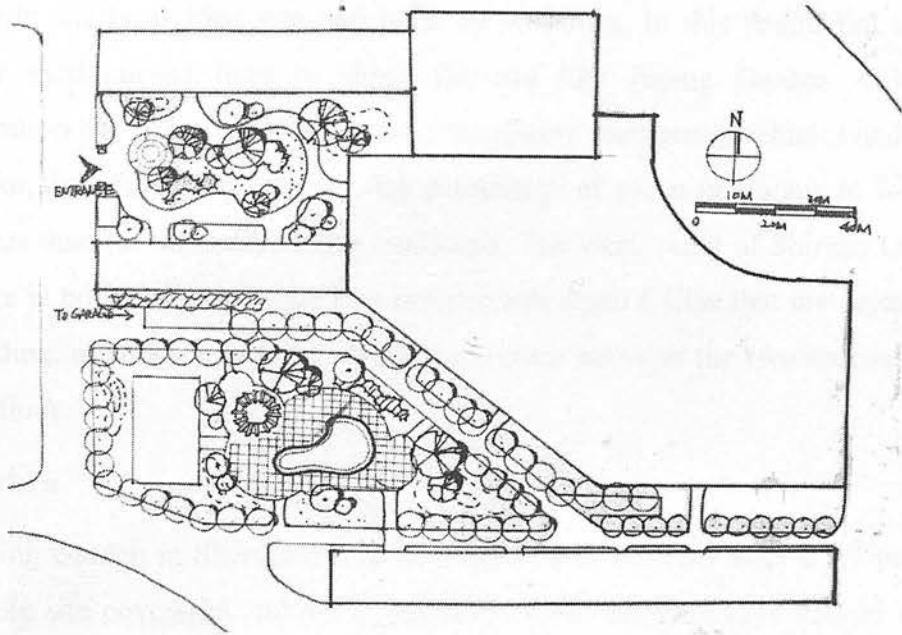


Figure 5-12: Plan of the CCG in Shimao garden



Figure 5-13: Images of Shimao garden

Shimao Garden (Figure 5-12 and Figure 5-13) uses looser, less formal shapes with

western-style elements in the CCG.

The whole site is divided into two parts by buildings. In this residential area, the designer used curved lines to shape the site like Jiajing Garden. Given that consideration has had to be given to accommodating emergency vehicles and leaving spaces for fire prevention vehicles, the percentage of green landscape in the whole site is less than for the hard-surface landscape. The weak point of Shimao Garden is that there is no link between the two independent small CCGs that are separated by the building, although there is a visual connection between the two spaces through the stilt floor.

3. Shenzhen

HuangTing Garden in Shenzhen (Figure 5-14) is a community with a 2.7 plot ratio. The whole site covers 28,700 m². From 2003, 2,045 families have moved into this community.

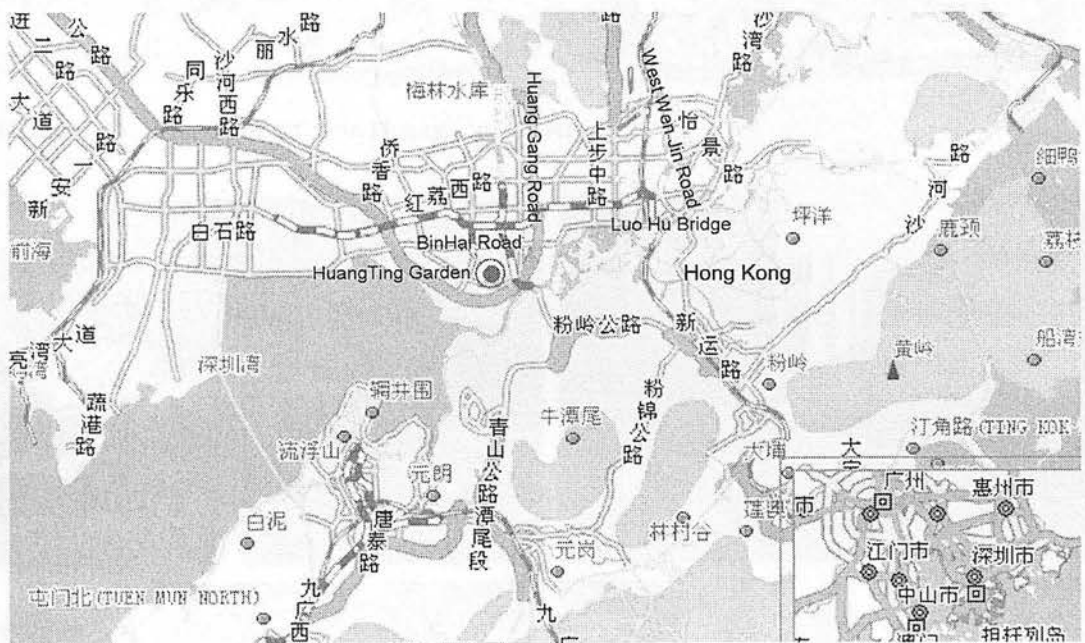


Figure 5-14: The location of the projects investigated in Shenzhen

Description of Huangting Garden

Huangting Garden (Figure 5-15 and Figure 5-16) is a space which has paid attention to perspective and the actual space changes at the same time. The main part of the CCG consists of a round-shaped open space, with an elongated plastic pavilion, and a pond at the other corner.

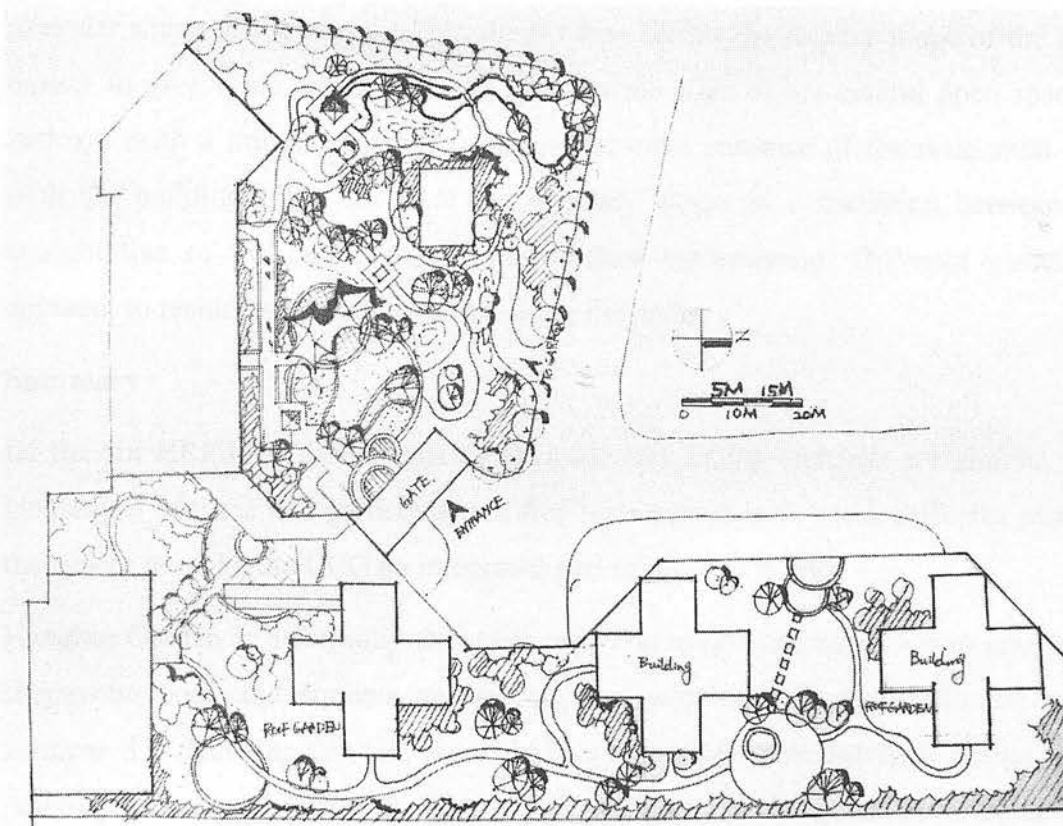


Figure 5-15: Plan of the CCG in Huangting Garden



Figure 5-16: Images of Huangting Garden.

The focus of the site is the round shaped lawn terrace at the centre of the CCG. The irregular shape of the stretched plastic pavilion breaks the regular shape of the lawn terrace to give some dynamic to the site. On the edge of the central open space, a pathway with a transparent roof connects the main entrance of the residential area with the buildings. The shape of the pathway works as a transition between the straight line of the buildings and the outdoor environment. Different vistas are apparent to residents when they move along the paths.

Summary

Of the six HRFRAs, the designs of Dangdai and Jiajing Gardens are similar. The landscapes of these two gardens are in free-style curves which link different parts of the spaces to make the CCG an integrated part of the whole area.

Huaqing Garden is a formally designed one. The main landscapes are in geometric shapes-the pool and squares are rectangular, with tress in line with the edge. Compared to Huaqing Garden, the other five CCGs are in an informal design style. Although some of them use geometric patterns, the way the geometric shapes have been arranged in the whole site is informal.

The strong points of Yicheng Garden are due to the detailed division of the big square and the location of the functional arrangements for users. These features eliminated the monotonous regularity and satisfied residents' actual use. Although the design of Shimao Garden is similar to Yicheng, somehow, the quality of this garden is less than Yicheng because there is no change of surface level and detailed space divisions in Shimao Garden.

The design of Huangting is a combination of both formal and informal design styles. The round shaped lawn terrace reinforces the visual effect of the garden's composition. At different parts of the CCG, geometric forms were used to adapt the change of the space that had been restricted by the buildings. As the distance increases from the building, the landscape becomes more informal than that close to the buildings. At the same time, plant arrangement keeps the level of openness and divides the spaces.

The table 5-1 below sum up the characteristics of the HRFRAs and the design

features of each CCG.

Table 5-1: Summary of the features of the CCGs						
	HuaQing	Dangdai	Yicheng	Jiajing	Shimao	Huangting
Year it was built	2000	2001	2003	2002	2003	2003
Size	1.3 ha	5.4ha	0.78 ha	2.21 ha	0.95 ha	1.47ha
Pattern of planning	Central	Central with small groups	Central	Multi-gro ups	Central with small groups	Central
Design Features	Formal	Informal	Formal	Informal	Informal	Informal
Proportion of natural vs man-made landscape	45% vs 55%	70% vs 30%	51% vs 49%	65% vs 35%	47% vs 53%	70% vs 30%
Quality of design	Fair	Good	Good	Good	Fair	Good

5.3 Administration and Results of the Investigation:



Figure 5-17: On-site questionnaire survey
(Source: the author, 2007)

This study was carried out in September, 2006 in three cities. As the main respondents of the investigation, HRFRA residents were randomly sampled to answer the questionnaire (Figure 5-17). There are two characteristics of this study: 1) The synchronic study in these residential areas; 2) The relatively evenly distributed number of questionnaires at each site.

During the investigation, the researcher followed the guidelines of Van de Vijver and Leung (1997, p.144) and tried to avoid problems in the survey process: 1) The characteristics of the interviewers may have had an impact on the participants' responses; 2) Aspects of the interaction between the interviewers and the

respondents, potentially, may have biased the data obtained; such as the language, or the way the interviewers talked to the respondents.

Although this had been considered at the questionnaire design stage and the questionnaire was duly modified, some terms or jargon might still have been problematic for some respondents. To avoid this problem, the interviewers were asked to overcome the doubts of the residents in an easy and straightforward way with good manners.

Sites in the three cities were chosen randomly. Those residents who met the investigator were asked to fill in a questionnaire. The random sampling reflects the actual use of the CCG from another point of view. To eliminate any bias which the random data collection might have, the author adopted two methods:

1) He distributed evenly the investigation time. People's actual use usually varies over a weekly period. They might only use the CCG in the morning, afternoon or evening; others might choose to use it at a time in the week or at the weekend. Thus the short-term data collection might bias the results of the study if a totally random sample selection was undertaken at any random time. The author chose three days (Tuesday, Thursday and one day of the weekend) during the week. Each day, the interviewers worked between 7:00 am to 8:00 pm to cover all the possible times when people might use the gardens.



Figure 5-18: On-site questionnaire survey in Shenzhen (Source: the author, 2007)

2) Questionnaire distribution point. A week-long study of use cannot account for all users of the outdoor environment, for example, monthly and seldom users might, because of their pattern of use, be omitted from a week-long investigation study such as here. The author, therefore, put tables near the gate of the residential areas and distributed questionnaires to residents who passed

by (Figure 5-18). In this way, he could engage with some residents who did not use the CCG at the time of his investigation so as to widen the scope of the random

selection of respondents. The feedback on this approach was good because many respondents, especially older people, brought their questionnaires home and asked their family members to fill them in.

The results showed that this way of the investigation was successful. Although there are some differences between the cities, the general male to female ratio was even across all three cities and the number of respondents reached the criteria of the author's research.

To ensure the validity of the questionnaire, strict criteria were used in the sifting of the questionnaires. The criteria for excluding an invalid questionnaire included two items: 1) If five consecutive answers were the same; 2) If the answers for four items or more were not answered.

Investigation in Beijing:

From June of 2006 to July 2006, 21 students of Beijing Forestry University carried out the study at Huaqing Garden, Dangdai Garden and Yicheng Garden. All these students were landscape architecture students in their final year of study. Before the investigation, Dr Peiyong Wang (Reader) trained these students in relation to the outlines that should be paid attention to in the interviews. The training contents were discussed with and set by the author of the thesis, and Dr Wang.

The training covered the communication skills of the interviewees, the meanings of some words in the questionnaire, a general introduction to the projects which would be surveyed. These contents were integrated into files and used in Hangzhou and Shenzhen respectively. According to the different projects investigated in both cities, the introduction to the projects was changed appropriately.

A total of 519 questionnaires were collected in the three-week survey.

After 18.7% of invalid questionnaires were rejected, the study was able to use a total of 437 valid questionnaires. YiCheng Garden (143), HuaQing Garden (150) and DangDai Garden (144) were the three projects in Beijing.

Investigation in Shenzhen:

From 22-25 August, 2006, Huangting Garden was surveyed in Shenzhen.

The author led the study. Five landscape architects from Idea Landscape Design Ltd. helped to carry out this study.

Over four days, a total of 166 valid questionnaires were collected from 202 questionnaires. The percentage of invalid questionnaire was 12.1%.

Investigation in Hangzhou:

From 30 September to 5 October, 2006, two high-rise residential areas in Hangzhou were surveyed.

Mr Yifei Sang led this study. Ten third-year students of Zhejiang College of Construction investigated two high-rise residential areas in Hangzhou. A total of 299 questionnaires were collected from Jiajing and Shimao Gardens after 10.7% of invalid questionnaires were rejected. Of the two high-rise residential areas, 140 respondents were from Jiajing Garden. The rest of the 159 respondents were from Shimao Garden.

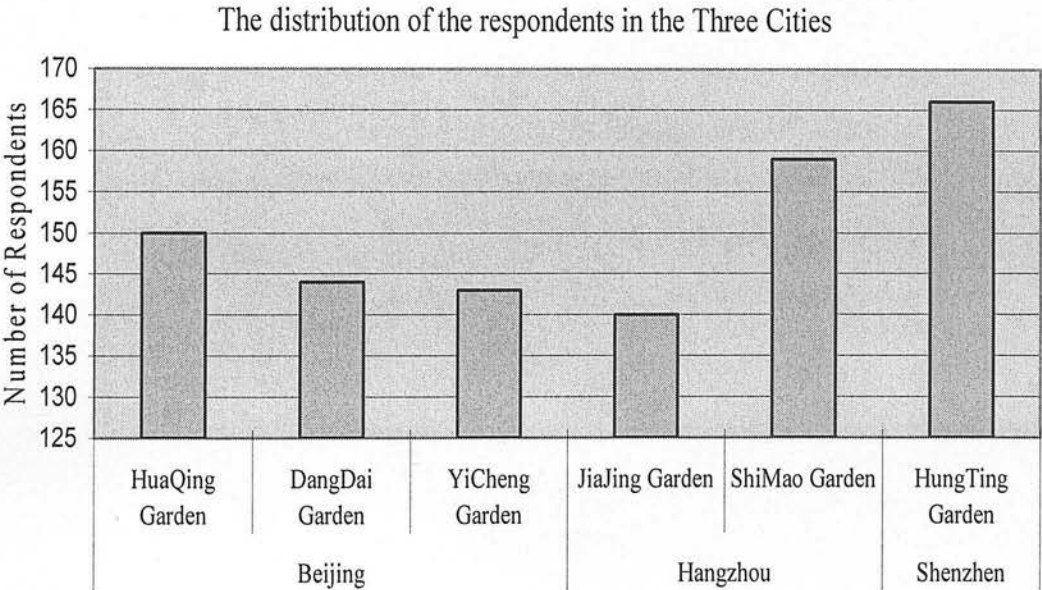


Chart 5-1

Generally:

In this study, a total of 902 questionnaires were collected from six projects in three cities (139 invalid ones (13.1%) were excluded). Of the respondents, 437 of them were from three residential areas of Beijing, 299 from two residential areas of Hangzhou and 166 from one residential area of Shenzhen. Chart 5-1 shows the

distribution of the data collection from THE different residential areas and cities.

Summary:

This chapter details the methodology of the investigation in the research design, sample selection and management of the investigation respectively.

In response to the fact where there is a lack of first-hand data about China, the researcher studied the three cities across a big geographical scope of China so as to support the generality of the analysis results. Compared to the distribution of the city samples, the questionnaire design, as the suitable investigation instrument, considered the relevant theories and special circumstances relevant to the HRFRAs. Through the on-site surveys, the quality of the questionnaire responses was maintained and the required numbers were collected in a short period of time.

Each sample data set was assigned out to two groups.

1. Several each used all three cities.

The analysis was based on the integration of the data collected from the three cities. The analysis aimed to identify commonalities and differences in the relationships between the

Part Four: Data Analysis

The main goal of the general analysis was to determine the common findings of the data. In this phase, the comparison of the effects of different environmental contexts on people's behaviour were provided and analysed.

2. Data analysis was undertaken at the city level to identify the psychological differences and the characteristics of each city in terms of

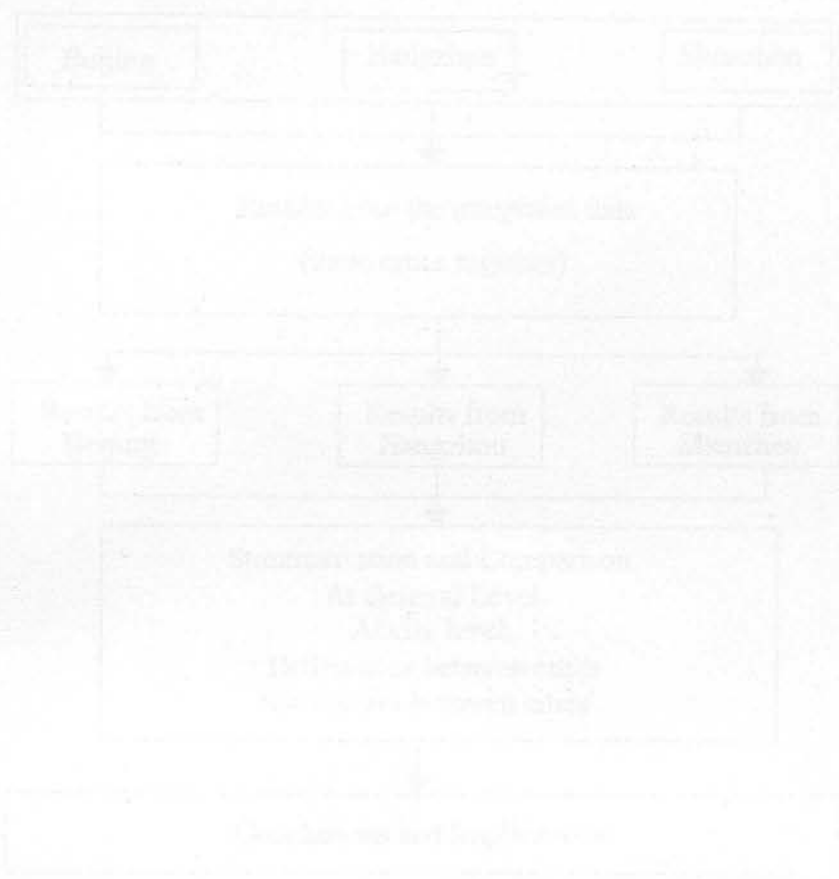


Figure 2.1: Data analysis process flowchart

The analysis was undertaken at the city level to identify the psychological differences and the characteristics of each city in terms of

In this study, analyses were carried out in two steps:

1. General analysis of all three cities.

The analysis was based on the integration of the data collected from the three cities. The analysis aimed to give a general description of the relationship between the preferred outdoor environment and actual use.

The results of this general analysis serve as the common findings of the HRFRA. In this phase, the comparison of the effect of different environmental aspects on people's behaviours were revealed and analysed.

2. Data analysis was undertaken at the city level to identify the psychological differences and the characteristics of actual use in each city.

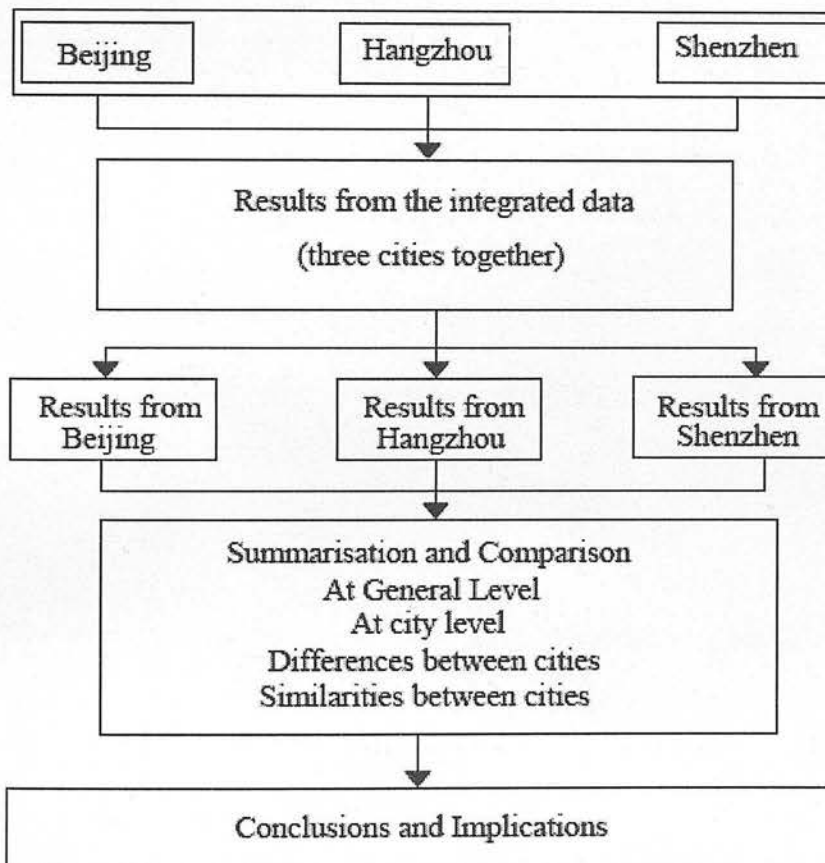


Figure 6-1: The procedure of the Analysis

In the second phase, the study concentrated on the psychological differences between the three cities, with the analyses following the same procedure as at the first phase.

Through the comparisons of the analysis results of the three cities, the characteristics of the psychological differences of each city were identified. The similarities and differences which are reflected in these results were summarised in a qualitative way in order to simplify the complex analysis results and present general findings about each city (Figure 6-1).

6.1.1 Description of the 9-subgroups of variables at general level (three cities together)

11 October

Explanation of different gender groups in each city
(independent for all three cities)



Figure 6-1: Distribution of variables for all three cities together

Chart 6-1

The purpose of this study was carried out in-field. The data reflects that in actual use of the CS 11, the observation of female residents is greater than male residents.

22 April 2011

Explanation of different gender groups in each city
(independent for all three cities)



Figure 6-2: Distribution of variables for all three cities together

Chart 6-2

Chart 6-2 shows that young people (18-24 years old) and older residents (65 years and over) are the most common groups in the study.

Chapter 6: Descriptive Analyses

6.1 General Descriptive Analyses (for all three cities together)

6.1.1 Description of the demographic variables at general level (three cities together)

1) Gender

Proportion of different gender groups among the respondents (for all three cities)

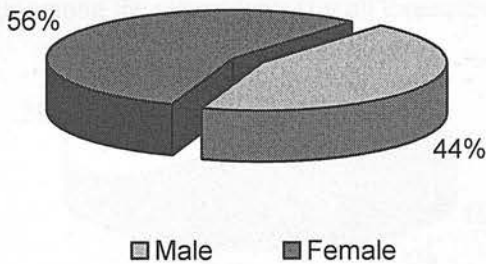


Chart 6-1

The number of male respondents was less than the number of female respondents. Of these residents, females made up 56% of the respondents, while males only made up 44% (Chart 6-1). The ratio of male to female is 1:1.27, which is higher than the ration 1.05:1 in national population survey. Considering the

investigation of this study was carried out in-field, the data reflects that in actual use of the CCG, the proportion of female residents is greater than male residents.

2) Age

Proportion of different age groups among the respondents (for all three cities)

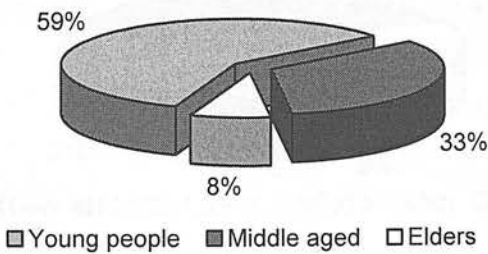


Chart 6-2

Chart 6-2 shows that young people, middle-aged and older respondents accounted for 59.0%, 33.4% and 7.5% respectively in this study (Chart 6-2). The percentage of young residents is much higher than that of middle-age and old residents. The total proportion was close to 8:4.5:1.

3) Length of Residence

Proportion of different length of residence groups among respondents (for all three cities)

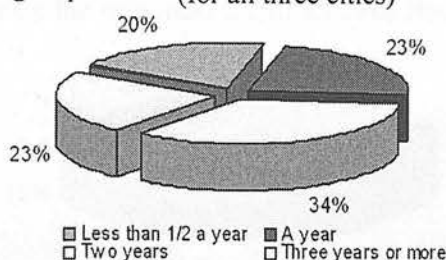


Chart 6-3
three years or more (Chart 6-3).

4) Number of Family Members

Proportion of different number of family member groups among the respondents (for all three cities)

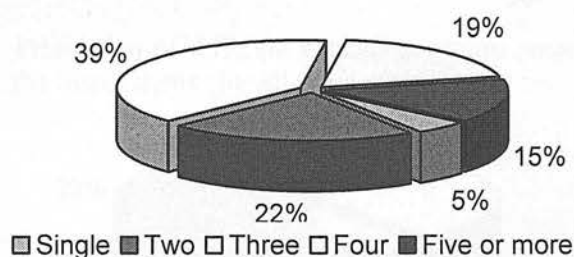


Chart 6-4

5) Income

Proportion of different income groups among the respondents (for all three cities)

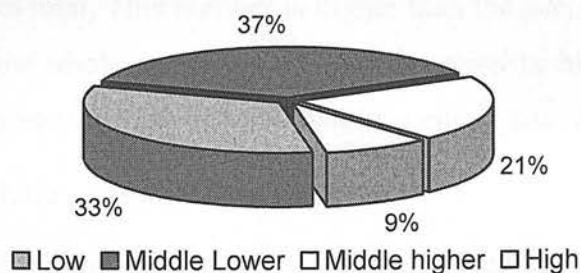


Chart 6-5

respondents (Chart 6-5). Among these respondents, middle-lower and low income residents take 70% together, which is much higher than the 30% of middle-higher and high income residents.

The average length of residence in this investigation of the three cities as a whole was longer than a year. Among these respondents, 20.9% have been in residence for less than half a year, 18.3% a year long, 33.9% for two years and 26.8% for

The average number of family members of the respondents is 3.17. Of all the respondents, there are 4.6% single family members in total, two-members make up 22.2%, three-member families, 39.3%, four-member families 19.3% and five or more member families 14.7% in total (Chart 6-4).

Of the respondents in the three cities, 70% of the residents in total are in relatively low income groups. Compared to relatively low-income groups, middle higher and high income residents make up 21% and 9% respectively, about one third of the total number of

6) Occupation

Proportion of the different occupation groups among the respondents (for all three cities)

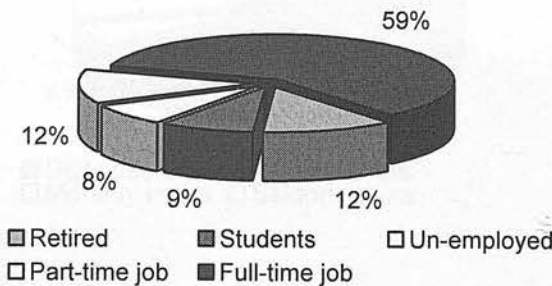


Chart 6-6

Among the respondents, full-time job residents take the dominant proportion with a percentage of 59.1%. In the rest part of the data, the percentage of retired residents is 12.1%, students 8.7%, part-time job, 12.4%. Un-employed respondents take the smallest part of the whole data at 7.7%, compared to the other

four occupation categories (Chart 6-6).

7) Education

Proportion of different education groups among the respondents (for all three cities)

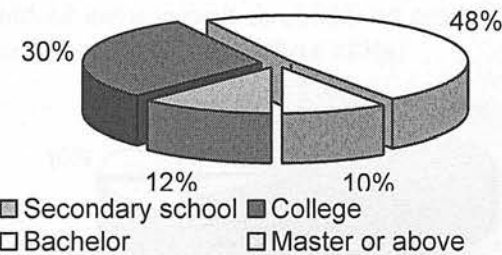


Chart 6-7

The distribution of educational attainment levels in the three cities taken together was 12.1% (secondary school), 30% (college), 48.1 (bachelor) and 9.8% (masters or above). Of these figures, highly educated residents make up 57.9% of the total number of respondents (Chart 6-7). The percentage of

high-educated residents (bachelor and master or above) takes 58% of the respondents in total. This number is higher than the averagely high education attainment level in the whole country. This might because the high-rise residential areas investigated are some middle class communities rather than the affordable houses.

6.1.2 Behavioural section:

1) Frequency of Outdoor Environment Use

Proportion of different frequency of use groups among the respondents (for all three cities)

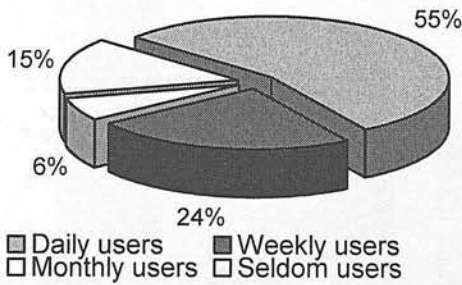


Chart 6-8

The percentage of the frequency of user groups in general was 56.2% , 23.6% , 5.7% and 14.5% for respondents who visited the CCG “almost everyday”, “once a week”, “once a month” and “seldom” (Chart 6-15). Of the four frequency of use groups, the percentage of monthly users is the smallest one.

The total percentage of monthly users and seldom users is 21%. The rest of residents visit the CCG frequently. This data indicates that most of the residents have a good habit to contact with the outdoor environment, and the CCG has become an important part of the residents’ daily life.

2) Frequency of Outdoor Environmental Use in Childhood

Proportion of different frequency of use of an outdoor environment in childhood groups among the respondents (for all three cities)

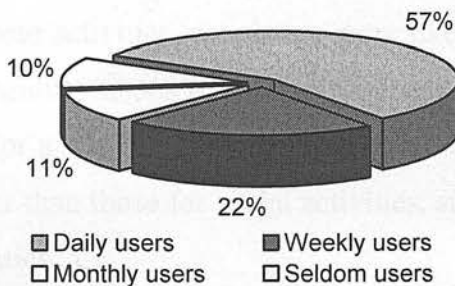


Chart 6-9

The percentages of each group in the whole data set are 56.6% (daily users), 22.2% (weekly users), 10.7% (monthly users) and 10.4% (seldom users) (Chart 6-9).

The percentages of the frequent users of the outdoor environment in childhood (daily and weekly users) are similar with the percentages of the frequently users as adults. There is only a slight difference between the percentage of the seldom users and monthly users. The percentage of seldom users in childhood is lower than the one as adults.

6.1.3 Environmental Preference Section

1) General attitudinal levels for the activities (the three cities together)

The following categories in chart 6-10 relate to the question “I prefer/like to visit the CCG to”:

Attitudes in response to activities (for all three cities)

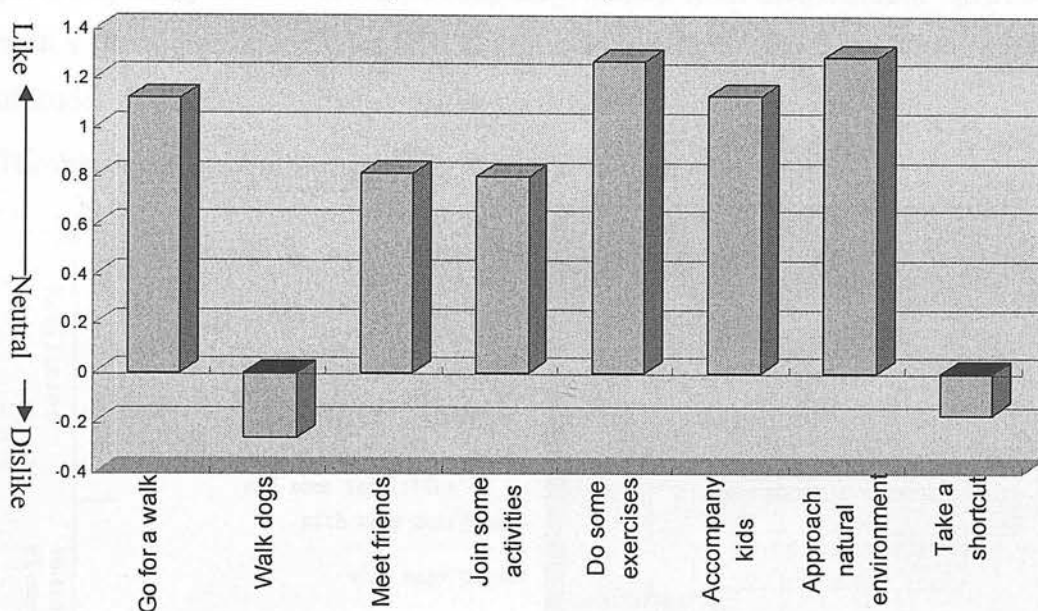


Chart 6-10

People from the three cities prefer “to go for a walk” (1.12), “to meet friends” (0.81), “to join in some activities” (0.8), “to do some exercise” (1.27), “to accompany children” (1.13) and “to approach a natural environment” (1.29) and the activities they disliked were “to walk dogs” (-0.26) and “to take a short cut” (-0.17).

Of these activities, people are more likely to visit an outdoor environment for nature and health reasons more than for social activities (Chart 6-19). Attitudinal levels for “go for a walk”, “to approach natural environment” and “to do some exercises” are higher than those for social activities, such as “to meet friends” and “to join in some activities”.

2) General attitudinal levels for physical attributes (the three cities together)

The physical attribute section contains 19 items from four categories: bird’s-eye view, area & safety, natural elements and facilities. Except for the variables “with pergolas and pavilions”, “a place where I can walk around it in 30 minutes”, “a garden in a geometric pattern” and a “landscape with vivid colours”, the attitudinal levels for the rest of the 15 items showed significant differences across the three cities. The attitudinal levels for the physical attribute variables are listed in Chart 6-11.

Respondents’ attitudes towards the physical attribute section indicate that people

prioritise safety first, in terms of what they wanted from their outdoor environment, with a strong agreement level at 1.39 (the numbers from -2 to 2 indicate the range of attitudes from dislike to like on a five-point scale).

The attitudes in response to physical attributes (for all three cities)

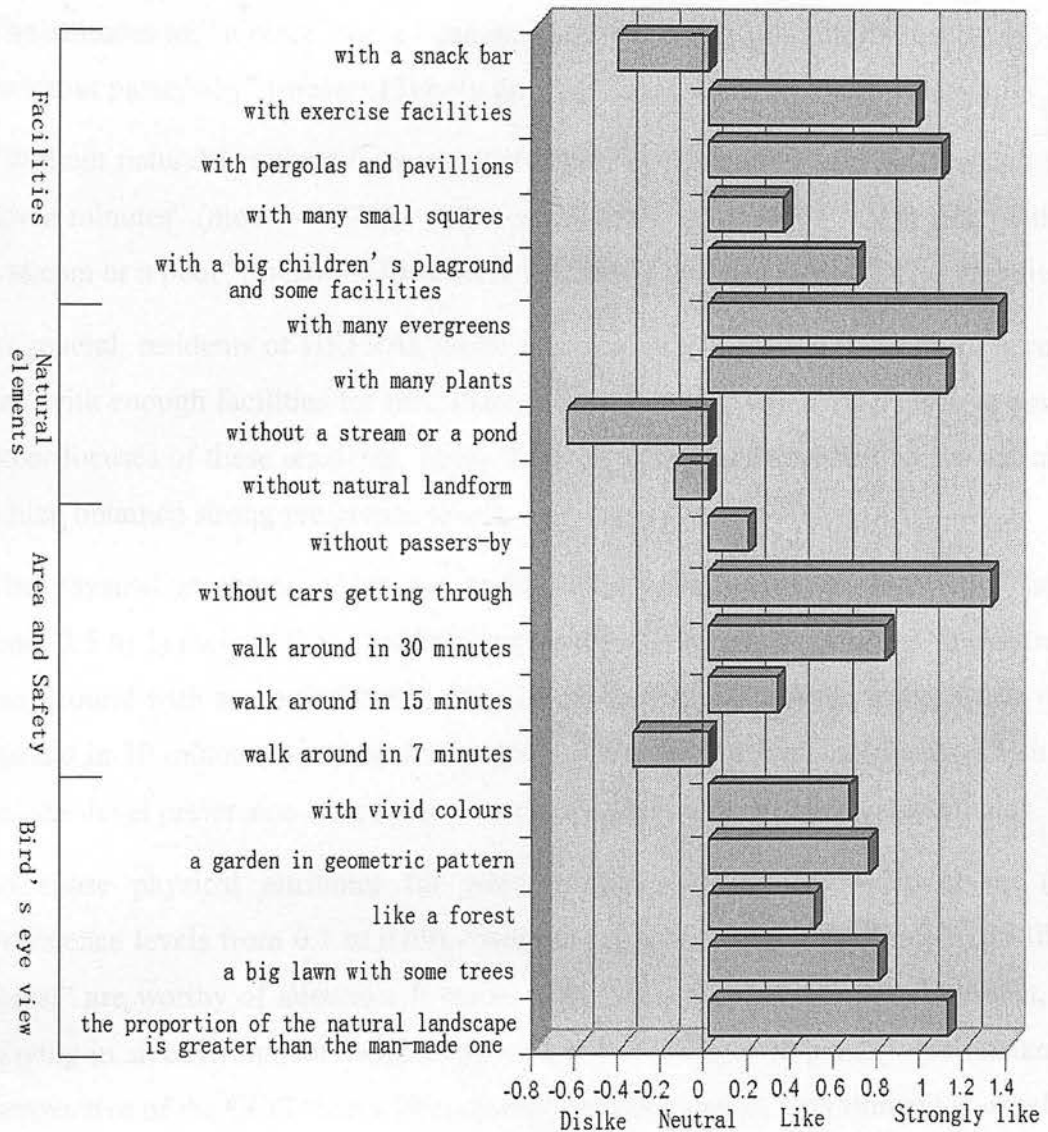


Chart 6-11

They also indicated strong agreement with items such as: “with many evergreens” (mean=1.21), “with pergolas and pavilions in the CCG” (mean=1.17), “the proportion of the natural landscape is greater than the man-made one” (mean=1.14), “with many exercise facilities” (mean=1.08) and “with many plants” (mean=1.03).

The items: “a place where I can walk around it in 30 minutes” (mean=.91), “a big lawn with some trees” (mean=.84), “a garden in a geometric pattern”(mean=.74),

“with a big children’s playground with many facilities” (mean=.74), “a woodland like a forest” (mean=.73), “with many small squares in it” (mean=.68), “landscape with vivid colours” (mean=.57) got middle-level agreement, compared to the items which had high preference levels at greater than 1.0.

The attitudes to: “a place where I can walk around it in 15 minutes” (mean=.47) and “without passers-by” (mean=.13) only got slight agreement across all three cities.

“Without natural landforms” (mean=-.1448), “a place where I can walk around it in seven minutes” (mean=-.1975), “with a snack bar in it” (mean=-.4229) and “without a stream or a pool” (mean=-.5195), were four items that received negative appraisals.

In general, residents of HRFRAs prefer an environment with high levels of security and with enough facilities for rest. Plants and a natural dominant perspective are the other focuses of these residents. These findings were made apparent by the variables which obtained strong preference levels.

The physical attributes which got middle-level agreement (i.e., preference levels from 0.5 to 1) include those facilities with particular functions (such as “a children’s playground with some facilities”), the size of the CCG (“a place where I can walk around in 30 minutes”) and bird’s-eye view items. The physical attributes which got middle-level preference were some items with clear purposes and characteristics.

Of those physical attributes for which people showed slight agreement (i.e., preference levels from 0.1 to 0.49), “without passers-by” and “the CCG looks like a forest” are worthy of attention. It seems that people prefer a quiet environment, but staying in an environment “without passers-by” or with dense plants which make the perspective of the CCG “looks like a forest”, might mean an environment is unsafe.

Compared to the physical attributes discussed above, items which recorded minus valued included: the environment without waterscape and landforms. People also disliked the small size of the CCG and the snack bar.

4) General attitudinal levels for perception and design styles (for all three cities)

In this section, the perceptual items, “a quiet place”, “a vibrant place”, “a comfortable place”, and the design-style items, “simple and practical”, “informal” and “suitable to the architectural style” obtained high preference levels, with a mean

of over 1.0. The average attitudinal level for “a quiet place” was 1.18, for “a vibrant place”, was 1.03 and for “a comfortable place”, was 1.325 (Chart 6-12).

Attitudes in response to the perception & design style variables (for all three cities)

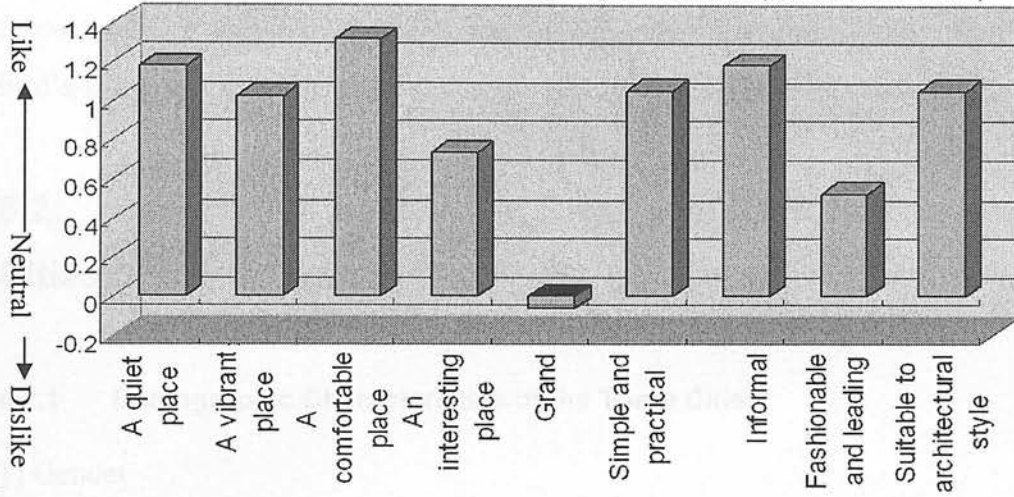


Chart 6-12

The mean for the perception item “an interesting place” and for the design style item “fashionable and leading”, were 0.74 and 0.63, respectively. The “grand” design style was the only one that was viewed negatively by the residents, with a value -0.06.

6.1.4 Judgement Importance Section

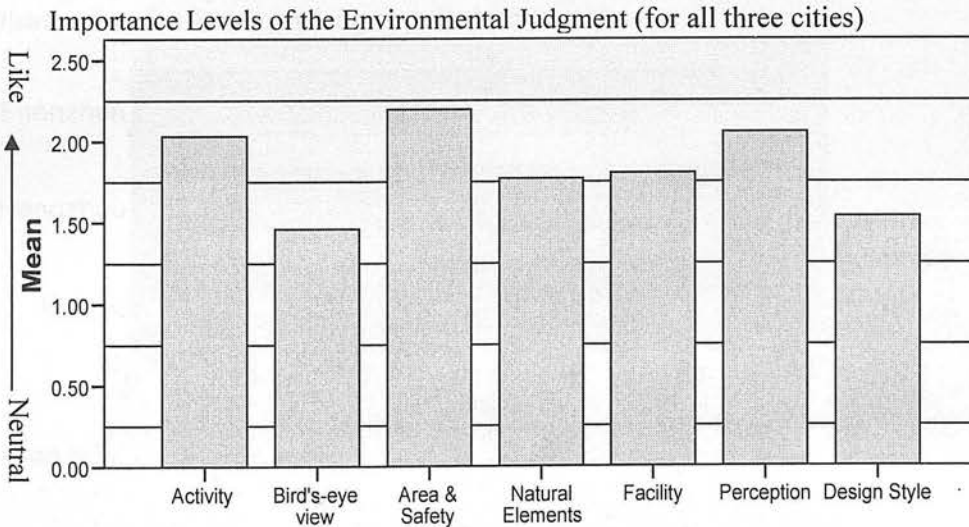


Chart 6-13

Primary analysis (Chart 6-13) showed that activity (mean=2.02), area & safety (mean=2.19) and perception (mean=2.05) were the respondents' three categories with high preference levels. Chart 8-10 indicates the mean of these categories respectively. Compared to the mean of the other categories, the mean of the bird's-eye view (mean=1.45) and design style (mean=1.55) were relatively low.

6.2: Descriptive Analysis at City Level (Differences between Cities)

6.2.1 Demographic Characteristics of the Three Cities

1) Gender

There is no statistically significant difference (Appendix-2) across the three cities (Chi-square=7.199, P-value=.206). The gender ratios (male to female) of Beijing, Hangzhou and Shenzhen were 100:131.2, 100:115, 100: 130 respectively (Chart 6-14).

Although the proportion of female respondents in each city was greater than the number of male respondents, Beijing and Shenzhen had similar gender ratios. Of the three cities, the gender ratio (male to female) of Hangzhou was the lowest one.

Distribution of different gender groups in the three cities

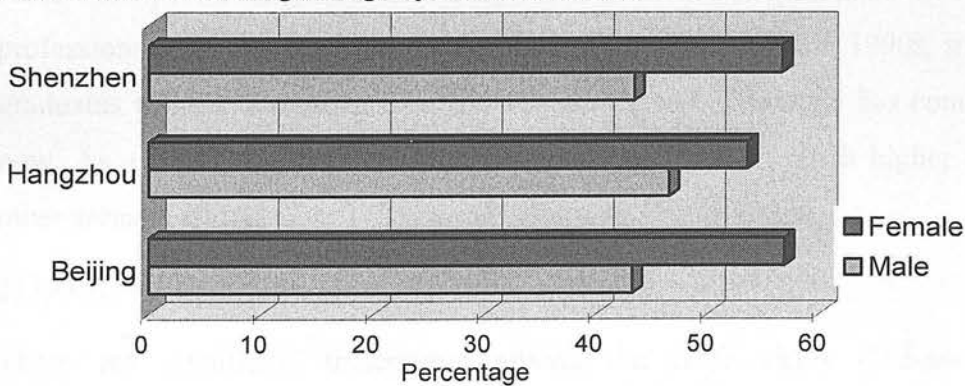


Chart 6-14

2) Age

There is a significant difference between the three cities (Chi-square= 20.512, P-value=.000). Shenzhen is at the lowest end of the age spectrum with an average

age of below 40 (in age groups, 1-Young (18-34); 2-Middle-aged (35-60); 3-Old people (60~)). Hangzhou is on the oldest end, with Beijing in between them.

Distribution of age groups (percentage) in the three cities

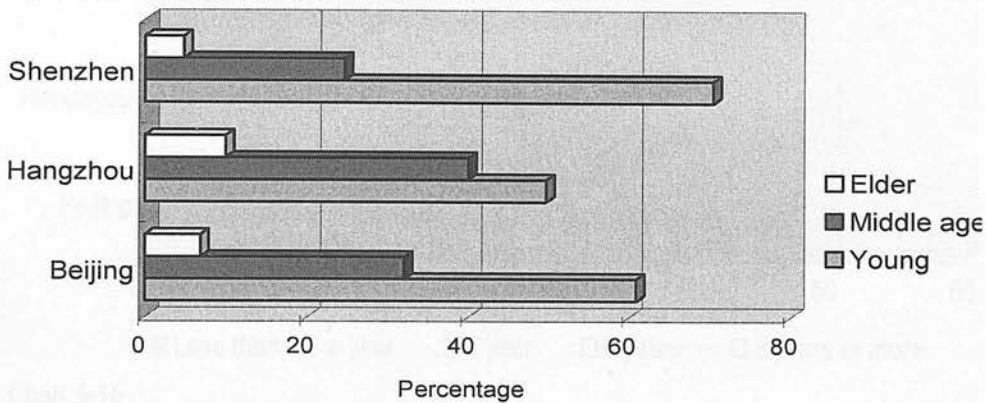


Chart 6-15

The distribution of the age groups in each city is shown in Chart 6-15. Young residents in Shenzhen accounted for 70.5% of the total respondents and the percentage of elderly people was 4.8%. Hangzhou had the oldest average age at 50. The proportion of young residents was relative low in Hangzhou, at 49.8%. Yet the proportion of elderly people was the highest of the three cities, at 10%. The average age of Beijing residents was in the middle, with 61% young people, 32.1% middle aged residents and 6.9% elderly people.

Shenzhen, as a new built immigrant city, has only been established for 28 years old. As an example of the government's Open and Reform Policy, it aims to attract young professionals to meet its society's needs. In the mid-1980s and 1990s, many young graduates went to Shenzhen to establish their career. This trend has continued until now. As a result, the proportion of young people there is much higher than in the other areas of China.

3) Length of Residence

There are significant differences among the three cities (Chi-square=6.689, P-value=.035). Chart 6-16 shows the distribution of residency in each city.

Beijing has the longest residency spans with an averagel of more than a year and a half; Shenzhen is next at a year and a half; and finally, Hangzhou with a residency span of a year and three months.

Distribution of the length of residence groups (percentage) in the three cities

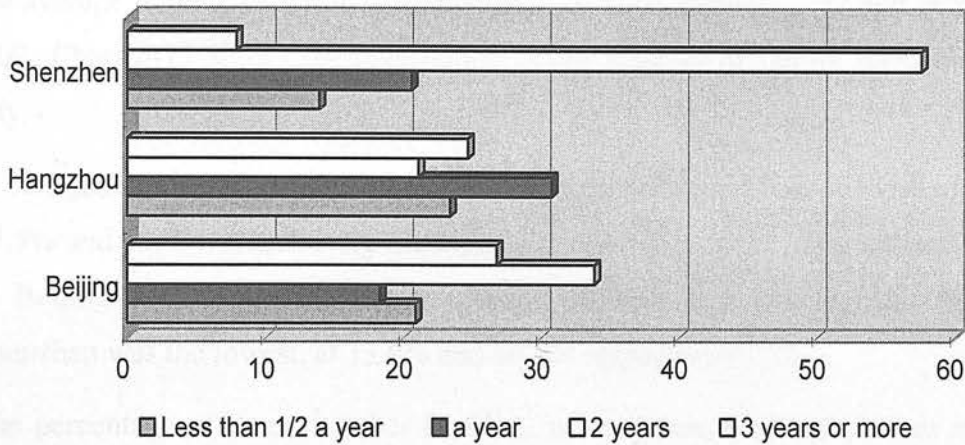


Chart 6-16

The distribution of the different length of residence groups in Beijing and Hangzhou are relatively even compared to Shenzhen, where 57.6% of residents who have a two-year residence span. In Beijing and Hangzhou, residents with a two-year residence span made up 33.9% and 21.1% respectively.

Respondents with three years or more residency in Beijing make up 26.8%, which is a little bit higher than Hangzhou (24.7%); while the percentage of people who have been living Shenzhen for three years or more is very low at only 7.9%.

Of those residents with a year-long residency, Hangzhou has the highest percentage at 30.8%. This is much higher than Beijing and Shenzhen, at 18.3% and 20.6% respectively.

4) Number of Family Members

Distribution of the number of family members groups (percentage) in the three cities

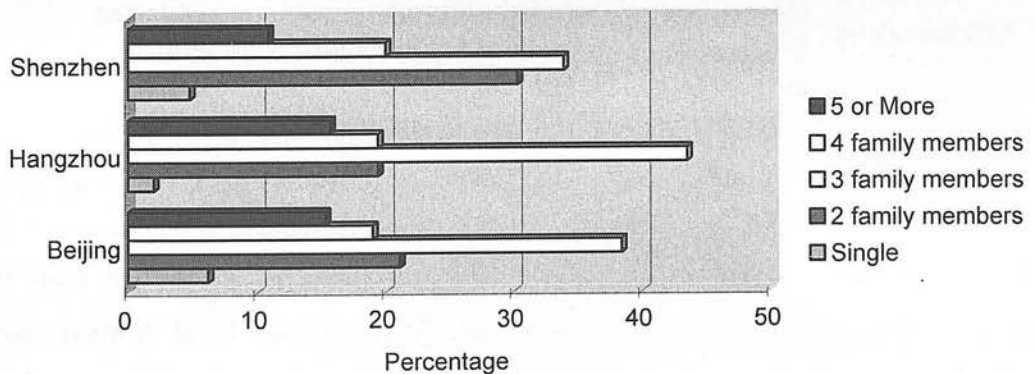


Chart 6-17

There is a significant difference across the three cities, in terms of the number of

family members (Chi-square= 6.174, P-value= .046). Of the three cities, in Beijing, the average number of family members is 3.16, in Hangzhou, 3.27 and in Shenzhen, 3.02. Chart 6-17 shows the distribution of the number of family members in each city.

In Hangzhou, the proportion of three-member families and five or more members is 43.5% and 15.7%, which were the highest percentages of the three cities. Compared to Beijing and Hangzhou, the percentage of three and five-member families in Shenzhen was the lowest, at 33.9% and 10.9% respectively.

The percentage of three-member families in Hangzhou was higher than in Beijing and Shenzhen. In Hangzhou, the percentage was 43.5%; in Beijing, it was 38.3%.

Each city has about 20% of its respondents with four family members.

Generally speaking, the number of family members in Beijing and Hangzhou is more similar than for Shenzhen, given the proportion of families with three or more family members. In Shenzhen, single and two-member families exist in relatively greater numbers than in the other two cities.

5) Income

Distribution of different income groups (percentage) in the three cities

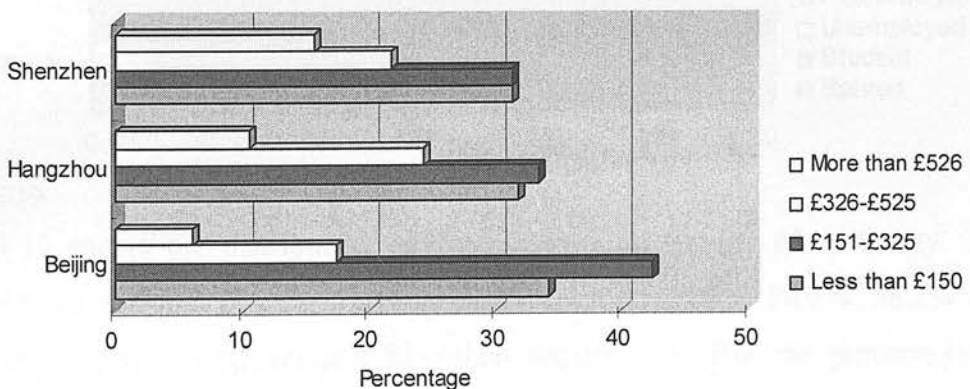


Chart 6-18

Chart 6-18 shows the distribution of different income groups in each city. The average income level of Beijing is the lowest of all three cities. The low and middle-lower income groups make up 76.4% of the total number of respondents in Beijing.

Shenzhen has the highest average income level. Among the four income groups, middle-higher and high income residents make up 37.4%. The percentage is the greatest of the three cities. The percentage of the same income groups in Hangzhou is 34.8% and 23.6% in Beijing.

In Hangzhou, the middle-higher income group makes up 24.3%. It is the highest percentage of the three cities.

The different income levels might result from economic differences, based on geographical location. Compared with Beijing, Shenzhen's economic environment is the best. Hangzhou, as a city situated between them in the Chang River Delta, is influenced by the economic development of Shanghai.

6) Occupation

There are no significant differences in terms of the percentage of occupational groups in each city (Chi-square= .495, P-value=.481).

Distribution of different occupation groups (percentage) in the three cities

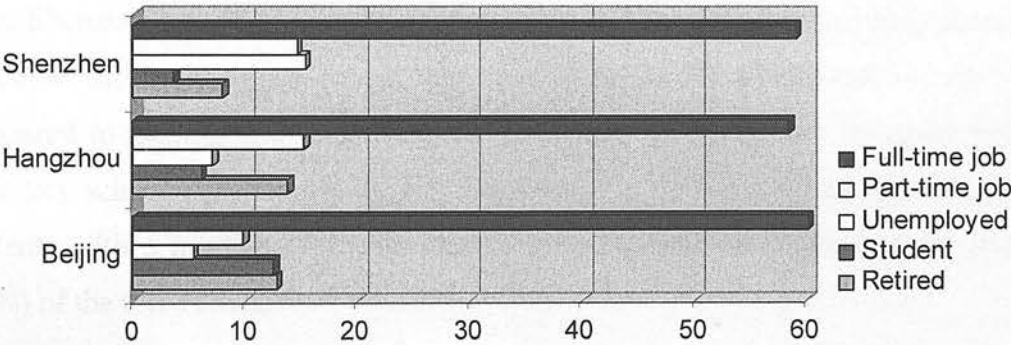


Chart 6-19

Chart 6-19 shows the distribution of the occupational groups of each city. The percentage of full-time job residents in each city was similar: 59.9%, 58.2% and 58.8% in Beijing, Hangzhou and Shenzhen respectively. But the percentage of retired residents in each city was quite different. Beijing and Hangzhou (12.7% and 13.7%) are much higher than Shenzhen (7.9%).

7) Education

According to the K-W test, the difference between the cities reaches a significant level (Chi-square=101.69, P-value=.000).

Of the three cities, the average educational level of Beijing respondents is closest to university education level, while for the other two cities (Shenzhen and Hangzhou), it is about at college level, on average.

Distribution of different education groups (percentage) in the three cities

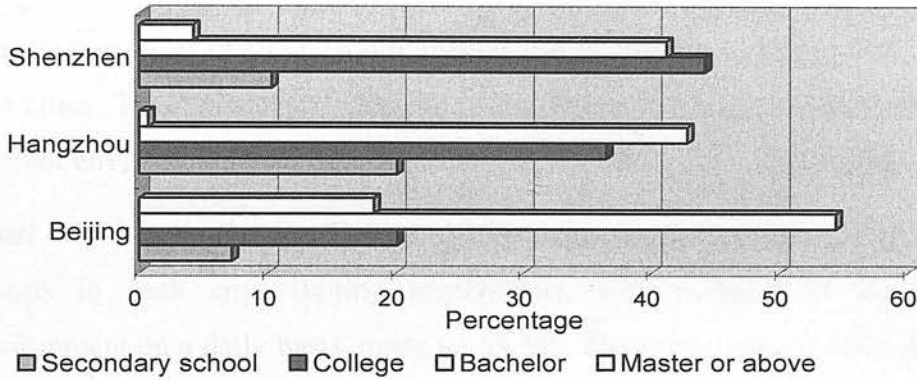


Chart 6-20

Chart 6-20 shows the distribution of the different educational attainment levels of the groups in each city. The percentage of residents in Beijing with bachelor or higher degrees, in total, is 72.6%. This proportion is much higher than for the other two cities; Shenzhen has 44.8% and Hangzhou, 43.5%. On the other hand, the percentage of people with only a high-school education in Beijing is the lowest, at only 7%. Compared to Beijing and Shenzhen, the percentage of Hangzhou residents with a secondary school education is the highest, at 20.1%. In this city, the percentage of residents with a masters or above education background residents was the lowest (0.7%) of the three cities.

In Shenzhen, the percentage of residents with a college educational background was the highest across the three cities, at 44.2%. It is 37% in Hangzhou and 19% in Beijing.

Beijing showed significant differences from Hangzhou and Shenzhen in terms of the percentage of residents with high educational attainment levels; bachelor degree holder: 55%; and, the masters degree or above, 18%. Beijing. This percentage is much higher than Shenzhen and Hangzhou (bachelor degree holder: 42.8% and 41.2% respectively; masters or above: 5% and 2% respectively).

6.2.2 Behavioural Section

1) Frequency of Outdoor Environment Use

The difference between the cities is statistically significant, according to the K-W test (chi-square=53.981, P-value=.000).

The frequency of outdoor environmental use in Beijing is higher than in the other two cities. This tendency is obvious in the figures of frequent users who enjoy the outdoor environment on a daily basis.

Chart 6-21 shows the distribution of the frequency of outdoor environmental use groups in each city. Beijing respondents, with a habit of visiting outdoor environment on a daily basis, made up 69.3%. The percentage of daily users is much lower in the Hangzhou at 44.1% and Shenzhen, 43.4%.

Distribution of the different frequency of use groups (percentage) in the three cities

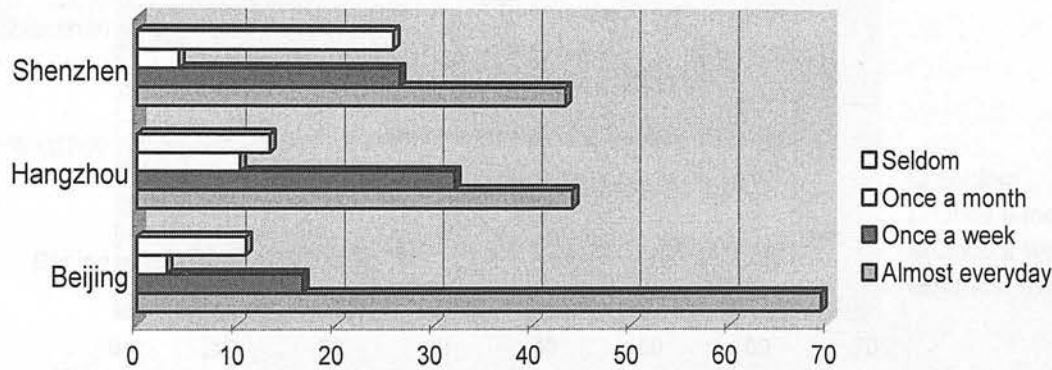


Chart 6-21

In Shenzhen, those who seldom visited an outdoor environment account for 25.9% of the total number of respondents. This is the highest percentage of the three cities. Beijing is the lowest, at 11%.

Hangzhou has the highest percentage of regular use frequency groups (once a week or once a month). The total percentage of these two groups in total was 42.5%, which is a higher percentage than for Shenzhen (30.7%) and Beijing (19.7%).

What is interesting here is the distribution of the regular use frequency groups in each city. Usually speaking, the better the climate is, the more likely the residents are to visit an outdoor environment. Hangzhou is the city which has the best climate and environment (the general condition of the three cities was discussed in Chapter 5).

Thus the percentage of frequent outdoor environment users should be higher than Beijing and Shenzhen.

However, the reverse applies. The percentage of frequent users in Beijing is much higher than in Hangzhou and Shenzhen. The reasons for this difference might be various. But the educational attainment level, occupation and age differences between cities may give some explanation for the differences.

2) Frequency of Outdoor Environmental Use in Childhood

The differences between the three cities reached a significant level (Chi-square=11.926, P-value=.003). The average frequency of use in Hangzhou is the highest, followed by Beijing and Shenzhen.

Distribution of the different frequency of use groups in childhood (percentage) of an outdoor environment in the three cities

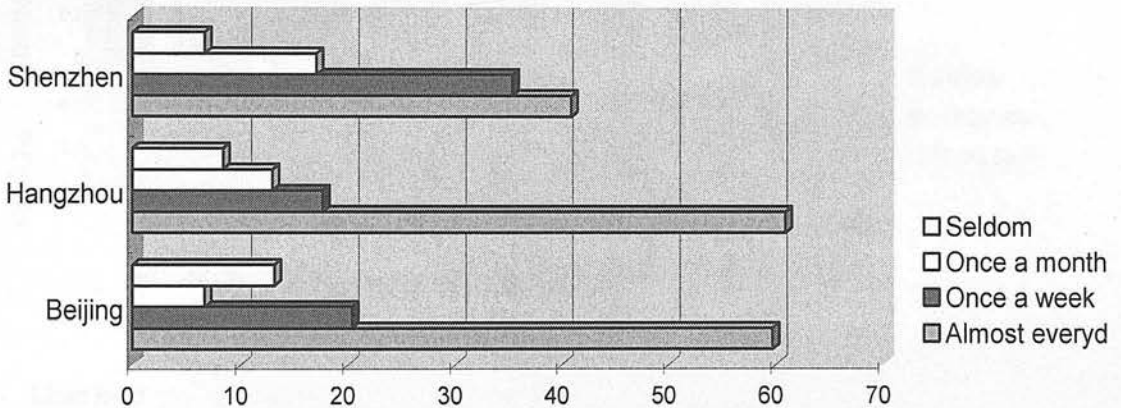


Chart 6-22

Chart 6-22 shows the distribution of childhood outdoor environmental use in each city. 60.9% of respondents in Hangzhou were daily users when they were young. This percentage is the highest of the three cities. Similar to Hangzhou, the percentage of Beijing residents who were daily users when they were young was 59.7%. Both the percentages of Beijing and Hangzhou residents who visited an outdoor environment on a daily basis in childhood were higher than Shenzhen, where the percentage was only 40.9%.

Compared to Beijing and Hangzhou, the percentage of Shenzhen residents who visited an outdoor environment on a weekly or monthly basis in childhood was higher, at 35.4% and 18.9% respectively.

In terms of the percentage of residents who seldom visited an outdoor environment when they were young, Beijing (13.2%) was higher than Hangzhou (8.4%) and Shenzhen (6.7%).

6.2.3 Environmental Preference Section

6.2.3.1 Attitudes in response to the activities at city level

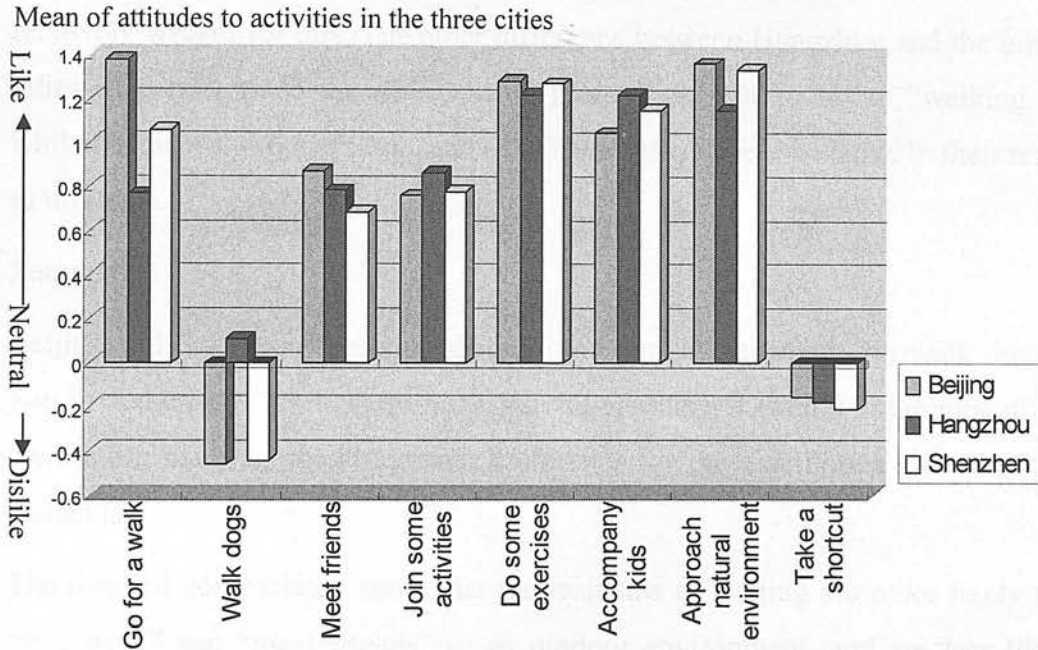


Chart 6-23

There were no significant differences between the cities in response to these activities. But there were significant differences between cities in response to the following activities “to go for a walk” (Chi-square=98.5 P-value=.000), “to meet friends” (Chi-square=10.23, P-value=.006), “to accompany children” (Chi-square=7.43, P-value=.024), “to approach a natural environment” (Chi-square=8.35, P-value=.015) which were preferred by people and the one they disliked-“to walk dogs” (Chi-square=48.1, P-value=.000) and “to take a shortcut”.

Among the three cities, the residents of Beijing showed relatively higher attitudinal levels than the other two about the following activities “to go for a walk” 1.38 (Shenzhen 1.06, Hangzhou 0.76), “to meet friends” 0.86 (Shenzhen 0.69, Hangzhou 0.79) and “to approach a natural environment” 1.37 (Shenzhen 1.34, Hangzhou 1.15), except for “to walk dogs” and “to accompany children” (Chart 6-23).

The average attitudinal levels for these activities in Shenzhen were similar to Beijing, but slightly weaker, such as “to go for a walk” and “to approach a natural environment”. Of the three cities, the Shenzhenese showed the lowest attitudinal level in terms of “to meet friends” (0.69), although this level is relatively low in the other two cities as well.

Hangzhou residents showed a strong preference for the activity “to accompany children” at 1.22. Compared to Hangzhou, Beijing residents’ preference level was relatively weaker for this. The other difference between Hangzhou and the other two cities is in relation to the respondents’ positive attitude (0.11) to “walking dogs”, while Beijing (-0.46) and Shenzhen (-0.439) residents were negative in their response to this item.

Summary:

Beijing and Shenzhen residents shared more similarities about “to walk dogs”, “to join in activities”, “to do exercises” and “to approach a natural environment”. They were more likely to show a greater preference for these activities than Hangzhou’s residents.

The detailed comparisons show that the residents of Beijing are more likely to “go for a walk” and “meet friends” in an outdoor environment, and are less likely to “accompany children” than the respondents in the other two cities.

Hangzhou’s residents gave the lowest mark to the activity, “to approach a natural environment”, of the three cities. This might be because the whole environmental quality of Hangzhou is better than Beijing and Shenzhen’s. Hangzhou residents use the big city open spaces such as the West Lake and other landscape areas of interest much more than the near-by natural environment close to their homes. In terms of “walking dogs”, only the residents of Hangzhou approved of this activity. Their attitudes were more even than the other two cities’ residents, in general.

6.2.3.2 Attitudes in response to physical attributes at city level

Physical attribute section includes 19 items in four categories. This makes the comparison of the preference level for these items between the three cities complex.

To make the results of these differences simple and clear, the comparison was carried out in different categories.

1. Bird's-eye View Category

Attitudes in response to the bird's-eye view variables in the three cities

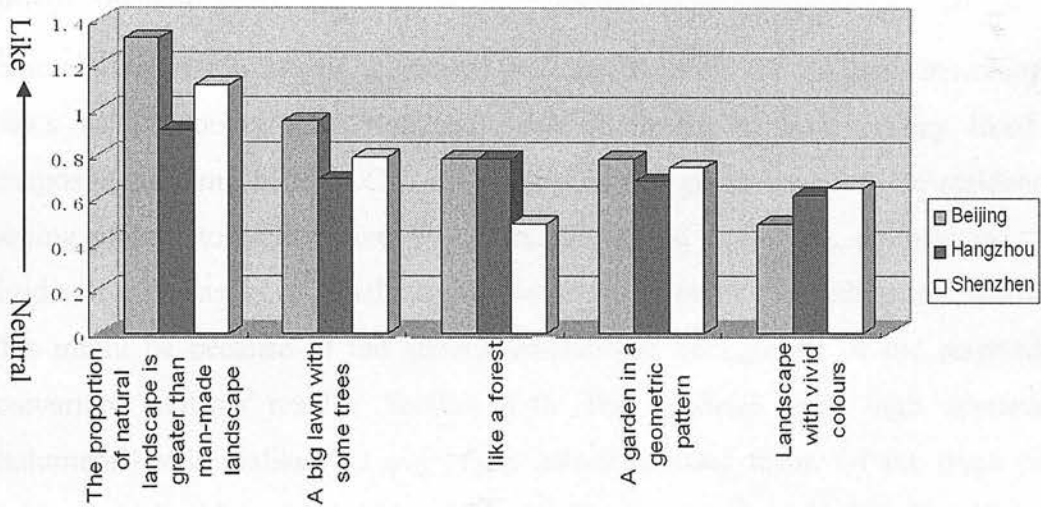


Chart 6-24

In the bird's-eye view category, the preference levels of Beijing residents to these view items were slightly higher than Hangzhou and Shenzhen, except for the landscape "with vivid colours" (Chi-square=3.65, P-value=.162, df=2), at an average of 0.51. The mean of Beijing for "the proportion of the natural landscape is greater than the man-made one" (Chi-square=36.7, P-value=.000, df=2), "a big lawn with some trees" (Chi-square=17.11, P-value=.000, df=2) and "like a forest" (Chi-square=12.08, P-value=.000, df=2) were 1.32, 0.95 and 0.78 respectively (Chart 6-24). Although there was no significant differences, the attitudinal level of Beijing to a landscape with a "geometric pattern" (Chi-square=2.17, P-value=.338, df=2) was higher than for the other two cities.

The attitudinal levels of Shenzhen respondents to these same items were similar to Beijing, except for the item "like a forest", where the mean for Shenzhen respondents was 0.49, the lowest of the three cities. Although there was no significant difference across the cities in terms of "a garden in a geometric pattern" and "the landscape of the CCG with vivid colours", respondents in Shenzhen showed a relatively higher preference for these items, especially "landscape of the CCG with vivid colours" which obtained a mean of 0.65.

Hangzhou residents' attitudinal levels were the lowest, relatively, of the three cities. Compared to the other two cities, their attitudinal levels to "the proportion of the natural landscape is greater than a man-made one", "a big lawn with some trees", got the lowest mean at 0.91 and 0.69 respectively, as did, "a garden in a geometric pattern" (insignificant).

Generally speaking, Beijing residents' preferences levels for outdoor environmental views were stronger than Hangzhou and Shenzhen residents'. They liked the composite structure of the CCG, both informal and geometric. But the residents of Beijing seemed to be sensitive to colours. Compared to Beijing, a landscape "with vivid colours" was more popular in the two southern cities, Hangzhou and Shenzhen. This might be because of the general educational background of the respondents (univariate analysis results, Section 6.4). The residents with high educational attainment levels disliked having bright colours around them. Of the three cities, Beijing has the highest educational levels. The other reason is that the climate of Shenzhen and Hangzhou is better than that of Beijing. The kinds of plants that can be grown there are much more varied than those which can be grown in Beijing. The residents in the two southern cities of China are used to bright colours and the variety of plant species, so Hangzhou and Shenzhen residents show a greater preference for vivid colours.

However, an excessive number of plants might reduce people's preferences. The item "like a forest" was viewed differently in Shenzhen, compared to Beijing and Hangzhou. The response to this item by Shenzhen residents was 0.42, the lowest of the three cities. The attitudinal level for this item was influenced by age (univariate analysis result, Chapter 6.4). Hangzhou, as the oldest city, likes an environment that is full of plants. However, the other possible reason that Shenzhen residents do, might be as a result of the extra plant growth. As a sub-tropical city, plant growth speed in Shenzhen is very fast and the plants often damage construction. Thus the extra lush plants which are "like a forest" might mean that they have a particular meaning for the residents. However, this situation is not obvious in the northern area of China.

2. Area & Safety Category

A comparison of the attitudinal levels for the area and safety variables of the three cities shows some interesting results. Except for the variable, “a place where I can walk around it in 30 minutes” (Chi-square=2.42, P-value=.299), the three cities had significant differences in relation to the rest of the four variables in this category. This result indicates that the respondents preferred a big community garden, generally. The mean for this variable was 0.94, 0.92 and 0.82 for Beijing, Hangzhou and Shenzhen respectively (Chart 6-25).

Attitudes in response to the area & safety variables in the three cities

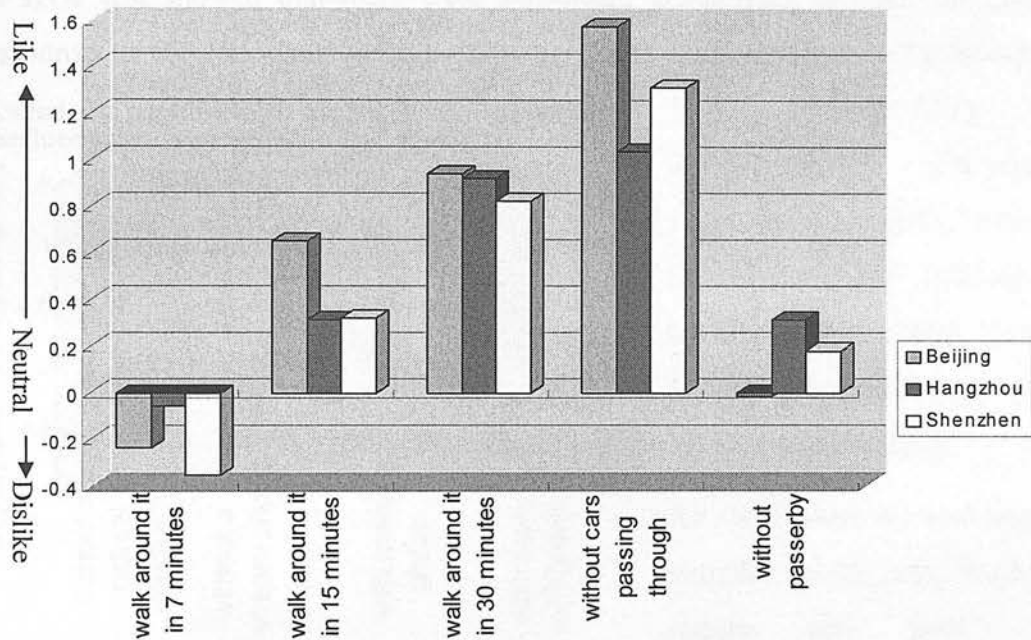


Chart 6-25

The residents of Beijing showed a relatively stronger preference for “a place where I can walk around in 15 minutes” and “without cars getting through” than did the other two cities. The mean for these two items was 0.65 and 1.58 respectively. Hangzhou and Shenzhen respondents did not show as great a preference as Beijing, particularly Hangzhou. The preference level for “walk around in 15 minutes” was 0.31 and “without cars passing through”, was 1.04.

While Hangzhou’s residents liked a large-sized CCG and gave it a high indication of their agreement, it seemed that they do not mind the small-sized outdoor environment at all. Contrary to the minus mean for “walk around in 7 minutes” in Beijing and Shenzhen, Hangzhou residents gave a relatively neutral value at -0.06.

The mean for this item in relation to Beijing and Shenzhen residents was -.23 and -.35 respectively.

The other big difference is that Hangzhou and Shenzhen residents prefer to visit a CCG “without passers-by”, (mean of 0.31 and 0.18 respectively), while Beijing residents showed a negative attitude to this item. They liked to visit a community garden with other people around them.

3. Natural Elements

A K-W test showed that there were significant differences between the cities in response to the following natural elements: “with many evergreens” (Chi-square=

Attitudes in response to the natural element variables in the three cities

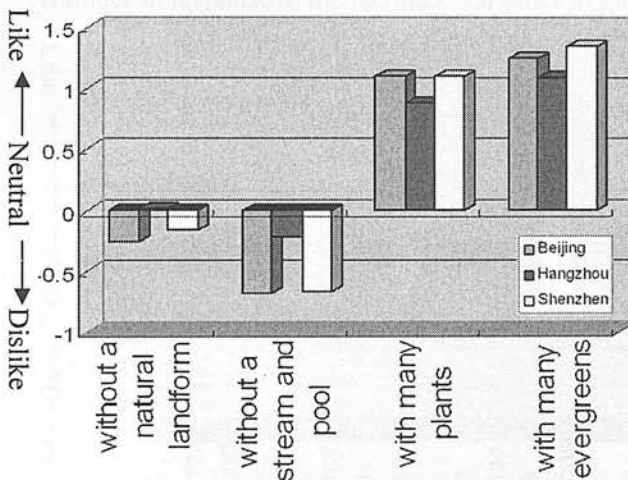


Chart 6-26

-0.21 and -0.66 for Beijing, Hangzhou and Shenzhen respectively. Although Hangzhou residents showed an almost neutral attitude to “without natural landform”, at 0.017, the other two cities showed negative attitudes, at -0.25 (Beijing) and -0.16 (Shenzhen) (Chart 6-26).

The other two items, “with many kinds of plants” and “with many evergreens”, got agreement from all three cities. People preferred to visit an environment “with many evergreens” more than “with many kinds of plants”. The average attitudinal levels to “evergreens” for the three cities were 1.25 for Beijing, 1.09 for Hangzhou and 1.35 for Shenzhen. For “many kinds of plants”, the averages were: Beijing 1.10, Hangzhou 0.88 and Shenzhen 1.1.

13.02, P-value=.001), “with many plants” (Chi-square= 15.14, P-value=.001), “without a natural landform” (Chi-square= 16.71, P-value= .001), “without a stream and pool” (Chi-square= 33.17, P-value= .000).

All three cities showed negative attitudes to the item “without a stream and pool”. The preference levels were -0.67,

In this category, the residents of Hangzhou had differences compared with Beijing and Shenzhen residents. The preference levels of Hangzhou residents for the four items were relatively weaker than for the other two cities. Beijing and Shenzhen showed similar attitudes to most variables in this category, because the high development density of both cities puts more pressure on residents than it does on Hangzhou's. The fast pace of life leads people in these two cities to enjoy the natural environment more actively than the people of Hangzhou. Compared to the other two cities, Hangzhou residents had relatively even attitudes to the natural environment, as before.

4. Facility

Attitudes in response to the facilities' variables in the three cities

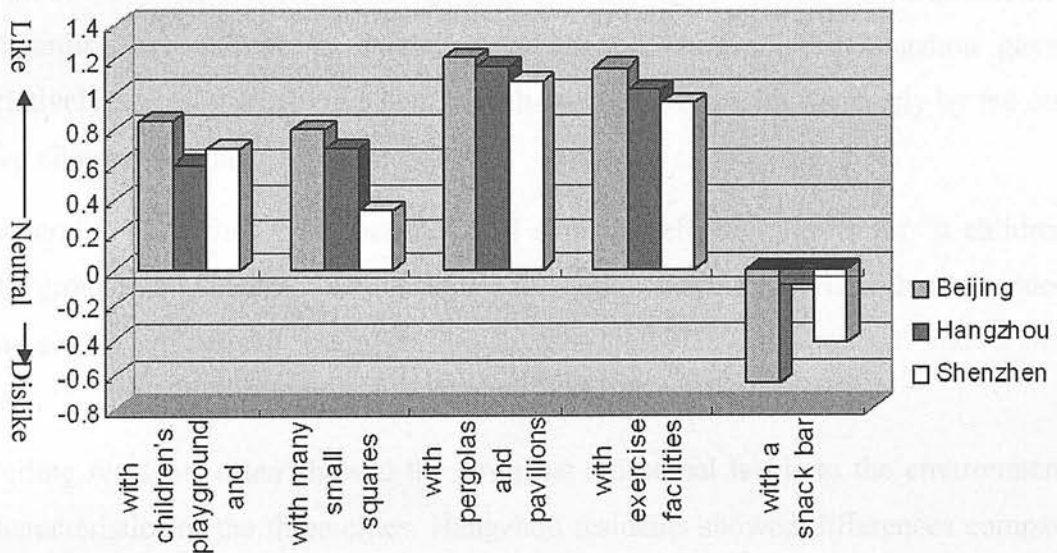


Chart 6-27

Facilities directly influence residents' daily life. Except for the items, "pergolas and pavilions", there were significant differences across the cities for the other four items. Chart 6-27 shows the attitudinal levels to these variables for the three cities. The K-W test results for the four items were: "many exercise facilities" (Chi-square=7.97, P-value=.019), "with a children's playground with many facilities" (Chi-square=8.35, P-value=.015), "many small squares" (Chi-square=29.33, P-value=.000), and "with a snack bar" (Chi-square=46.58, P-value=.000).

The item "pergolas and pavilions", as the most popular rest facility, showed the

highest preference levels in each city. Similarly, “exercise facilities” were welcomed by the high-rise residents. The values for “exercise facilities” in the three cities (Beijing 1.16, Hangzhou 1.03, Shenzhen 0.96) are higher than for the other items in this category (Figure 6-27).

In response to “a children’s playground with facilities”, Hangzhou residents showed a lower attitudinal level, at 0.6, than Beijing and Shenzhen, where the figures were 0.85 and 0.69 respectively.

The preference level of Shenzhen for “many small squares” was the lowest of the three cities, at 0.34 (Beijing 0.8 and Hangzhou 0.69).

All three cities gave a negative appraisal of the “snack bar” in the CCG. The attitudinal levels were -0.65(Beijing), -0.084(Hangzhou) and -0.42 (Shenzhen). Regarding the attitude to natural elements, the residents of Hangzhou gave a relatively neutral value to this item, which was disagreed with strongly by the other two cities’ residents.

Generally, Hangzhou and Shenzhen had similar preference levels for “a children’s playground and facilities” and “exercise facilities”. Beijing and Hangzhou’s residents had similar attitudes to “many small squares”, “pergolas and pavilions” and “a snack bar”.

Beijing residents often showed the strongest attitudinal levels to the environmental characteristics of the three cities. Hangzhou residents showed differences compared with Beijing and Shenzhen about many items. The attitudinal levels of Hangzhou residents were often in the middle of the other two cities, except for the item “snack bar”. The moderate attitudes of Hangzhou residents to natural environmental elements and facilities indicated that Hangzhou, as a famous city suitable for restoration, were different from Beijing and Shenzhen residents.

6.2.3.3 Attitudes in response to perception & design Style

1. Differences of the attitudes in response to the perception between cities (at city level)

There were significant differences between the cities in response to the perceptual

items “a quiet place” (Chi-square=18.4, P-value=.000) and “a comfortable place” (Chi-square= 23.72, P-value=.000). The differences for the other two perceptual items across the cities were not significant, statistically.

Attitudes in response to the perception & design style variables in the three cities

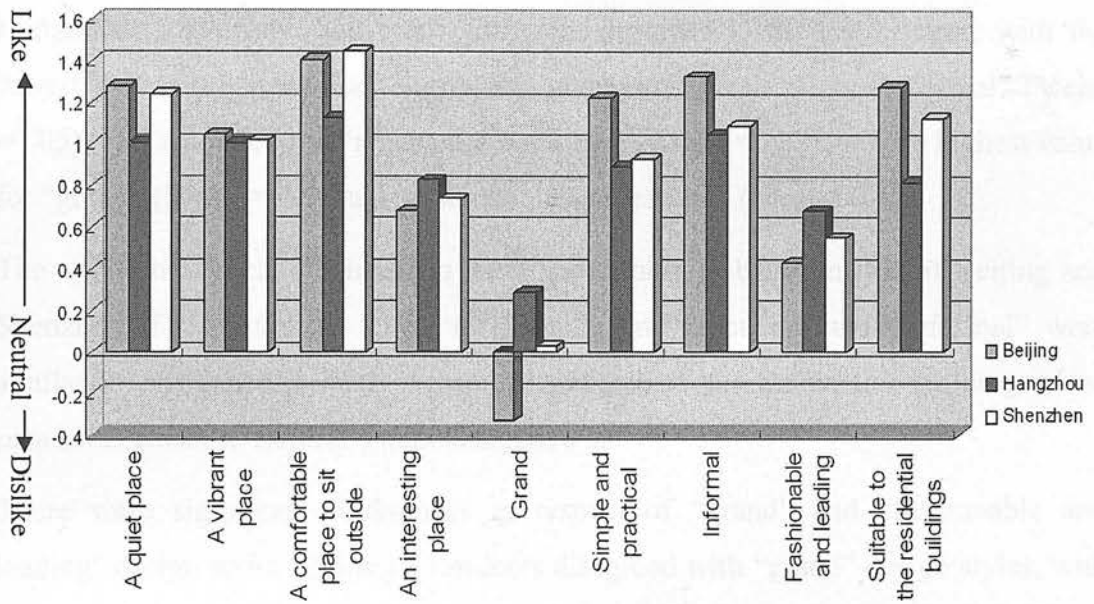


Chart 6-28

The attitudinal levels of Hangzhou were different from the other two cities. In the perception category, Beijing and Shenzhen shared more similarities than they did with Hangzhou in terms of “quiet” and “comfortable” environmental characteristics. The attitudinal levels of the Hangzhou residents for these two items were relatively low. The difference is that Hangzhou’s residents showed a somewhat higher preference level for “an interesting place”, at 0.83 than Beijing and Shenzhen, at 0.68 and 0.74 respectively (Chart 6-28).

2. Differences of the attitudes in response to the design style between cities (at city level)

There were significant differences between the three cities for all the design style variables. The results of the K-W test for the five design style items were “grand” (Chi-square= 86.1, P-value= .000), “simple and practical” (Chi-square= 41.8, P-value= .000), “informal” (Chi-square= 23.2, P-value= .000), “fashionable and leading” (Chi-square= 17.03, P-value= .000) and “suitable to residential buildings” (Chi-square= 24.01, P-value= .000).

Beijing showed the strongest preference for all five items of all three cities. The preference level for “simple and practical” was 1.23, “informal”, 1.33 and “suitable to the residential buildings”, 1.28, “grand”, -0.33 and “fashionable and leading”, 0.43 (Chart 6-28).

Hangzhou, conversely, had totally different attitudes to the same items, with the lowest preference levels for “simple and practical” (Mean =0.9), “informal” (Mean =1.05) and “suitable to the residential buildings” (Mean =0.82) and the highest value for “grand” (Mean =0.29) and “fashionable and leading” (Mean =0.68).

The attitudinal levels of Shenzhen were somewhere in between that of Beijing and Hangzhou. The attitudinal levels for “simple and practical” and “informal” were similar to Hangzhou’s. With regard to “suitable to the residential buildings”, the mean was closer to Beijing’s than Hangzhou’s.

There were significant differences in respect of “grand” and “fashionable and leading” design styles. Beijing’s residents disagreed with “grand” design styles, with an average attitudinal level of -.33. Shenzhen and Hangzhou were neutral (0.03 and 0.29 respectively), though they all showed a preference for “fashionable and leading”, Hangzhou had the strongest one, with an average preference level of .68, which was higher than Beijing (0.43) and Shenzhen (0.55).

At the same time, Hangzhou and Shenzhen showed some similar preference levels for “simple and practical” (0.9, 0.93) and “informal” (1.05, 1.09) design styles. Beijing and Shenzhen showed similar attitudinal levels for “suitable to the residential buildings” (1.28 and 1.13).

In general, residents had a positive attitude to the CCG, which is ‘a comfortable place’. This tendency was stronger in Beijing and Shenzhen than in Hangzhou. People in Hangzhou gave a relatively low mark for this variable and “a quiet place”.

This might be as a result of the differences in climate. Beijing is in the north of China, which is cold in winter and hot in summer. The relatively extreme temperatures make residents pay attention to the environments which can protect them from unpleasant weather. Although winter in Shenzhen is warmer than in Beijing, its summer is so hot that it makes people feel uneasy. Of the three cities, the

natural climate of Hangzhou is better than that of Beijing and Shenzhen. This factor may lead to its residents holding different attitudes to this variable.

The “grand” design style, which was represented by the huge size of a square, a large fountain and western architectural design style, was not popular among the user groups across the country. This view is very different from what real estate developers had thought. In many cities, developers, even some designers, pursued the difference in design. They often seem to think that these design styles present different living styles and hope to transplant them arbitrarily into China. The investigation results show that the idea of imitating foreigners’ designs is inappropriate for the Chinese context. People usually prefer to see some kind of informal, simple and practical environment, and in harmony with the residential buildings.

7.4 Questionnaire on people all China Cities

Table 7.2 The results of the questionnaire on people all China Cities (Unit: %)

Variables	Items	Value	
		Value	Remark
Attitude	V12 To improve design	42	Good
	V13 To join in some activities	72	Positive
	V16 To appreciate urban environment	72	Positive
	V19 To improve the urban landscape	72	Positive

Chapter7 Demographic Characteristics of the Environmental Preference (univariate analysis)

In this part, a series of regression analyses were carried out to explore the characteristics reflected in the place components. The results identified the place characteristics which residents from many different demographic backgrounds preferred. This part of the analysis has two intentions in relation to this study:

- 1) To deepen our understanding of the environmental preferences with the users' demographic backgrounds in mind.
- 2) To explain the differences as reflected at a city level.

The tables below list the results of the univariate analysis.

7.1 General Information about all Three Cities

Table 7-1: The results of the univariate analysis (for the three cities taken together)

	Variables		Beta	P-value	Trend
Gender	V12	To meet friends	.141	.000	Female+
	V13	To join in some activities	.072	.030	Female+
	V16	To approach a natural environment	.123	.000	Female+
	V18	The proportion of natural landscape is greater than man-made one	.121	.000	Female+
	V21	A garden in a geometric pattern	.075	.026	Female+
	V30	With many plants	.078	.025	Female+
	V32	A big children's playground with many facilities	.094	.005	Female+
	V37	A quiet place	.106	.002	Female+
	V38	A vibrant place	.066	.049	Female+

	V41	The design style is grand	.067	.041	Female+
	V42	The design style is simple and practical	.073	.028	Female+
Age	V10	To go for a walk	.077	.029	Elder+
	V14	To do some exercises	.070	.049	Elder+
	V15	To accompany children	.079	.030	Middle age+
	V20	The CCG is like a forest	.081	.015	Middle age+ Elder+
	V29	A place without a stream or a pool	.083	.020	Middle age+
	V32	A big children's playground with many facilities	.091	.013	Middle age, Elder+
	V33	Many small squares	.127	.000	Middle age+
	V37	A quiet place	.074	.042	Middle age, Elder+
Number of family members	V11	To walk dogs	-.084	.012	3,4,5-
	V12	To meet friends	.089	.008	2,3,4,5+
	V13	To join in some activities	.094	.006	2,3,4,5+
	V15	To accompany children	.093	.006	2,3,4,5+
	V17	To take a shortcut	-.134	.000	2,3,4,5-
Income	V15	To accompany children	.076	.037	Mid-lower+, Mid-higher+, High+
	V27	A place without passers-by	.082	.016	Mid-higher, High+
	V32	A big children's playground with many facilities	.108	.002	Mid-higher, High+
Occupation	V10	To go for a walk	-.078	.035	Students, part-time job, full-time job-
	V15	To accompany children	.077	.044	Retired, un-employed, part-time job and Full-time job +
	V29	A place without a stream or a pool	.095	.010	Student, un-employed, part-time job+
	V42	The design style of CCG is simple and practical	-.139	.000	Student, part-time job, full-time job residents-

	V43	The design style of the CCG is informal	-.128	.001	Student, part-time job, full-time job -
Education	V10	To go for a walk	.194	.000	Bachelor, Master+
	V11	To walk dogs	.048	.037	Master-
	V14	To do some exercises	.162	.000	College, Bachelor, Master+
	V15	To accompany children	.098	.006	College, Bachelor, Master+
	V16	To approach a natural environment	.137	.000	College, Bachelor, Master+
	V18	The proportion of the natural landscape is greater than the man-made one	.156	.000	Bachelor, Master+
	V19	A big lawn with some trees	.127	.000	College, Bachelor, Master+
	V22	The trees, architecture and squares of the CCG with vivid colours	-.102	.002	Bachelor, Master-
	V24	A medium-sized place where I can walk around it in 15 minutes	.076	.024	Secondary school, Bachelor, Master+
	V26	A place without cars passing through	.279	.000	College, Bachelor, Master+
	V28	A place without natural landform	-.116	.001	Secondary school, Bachelor, Master-
	V29	A place without a stream or a pool	-.111	.001	Bachelor, Master-
	V36	A snack bar	-.215	.000	college, Bachelor, Master-
	V37	A quiet place	.157	.000	College, Bachelor, Master+
	V40	An interesting place	-.108	.001	college, Bachelor, Master-
	V41	The design style is grand	-.204	.000	Bachelor, Master-
	V42	The design style is simple and practical	.166	.000	Bachelor, Master+

	V43	The design style is informal	.127	.000	Secondary school, Bachelor, Master+
	V44	Fashionable and leading	-.130	.000	Bachelor, Master-
Length of Residence	V11	To walk dogs	-.113	.001	Two years or more-
	V44	Fashionable and leading	-.70	.036	Two years, three years or more -
COEUF	V12	To meet friends	-.079	.017	Monthly users, Rarely users-
	V13	To join in some activities	-.118	.000	Weekly , Monthly , Rarely users-
	V15	To accompany children	-.093	.005	Monthly, Rarely users-

From this table, the preferences of the residents have been listed according to their demographic background. The general description of the outdoor environment and the preferred activities can help designers to acknowledge the characteristics of each demographic group.

Summary:

The univariate analysis results (Table 7-1), showed that the frequency of use of the outdoor environment in childhood and the number of family members have an influence only on the activity variables. These two demographic variables do not affect the other physical attribute and perception variables.

Education and gender have an influence on more variables than other demographic variables.

1) Gender:

Compared to male residents, females were more likely to use the CCG for public activities/events such as to “meet friends” or to “join some events”.

Females showed more accommodation to the environment than males. These accommodations were reflected in their attitudes to the physical attributes and their perceptions of the CCG. Females enjoyed the informal design style as well as the geometric patterns of an environment. On the other hand, an environment with a quiet, simple and practical design style and one in a grand, fashionable and leading design style, that evoked vibrant perceptions, were favored by female residents. The

attitudinal levels of the males in response to these environmental characteristics were not as strong as for the females. However, the results show that the preference levels of the females for some environmental characteristics were higher than for the males rather than an indication that female residents enjoy every kind of style equally.

2) Age:

The main differences existed between the young residents and middle-aged and older people.

Older people were more likely to do some personal activities such as “go for a walk” and “do some exercises” than middle-aged residents and young people.

Compared to young and middle-aged people, the purpose of old age residents visiting the CCG was for relaxation or healthy reasons, because they showed a higher preference level for the CCG with a “quiet” perception than did the other two age groups and they visited the CCG to “do some exercises” and “go for a walk”. In contrast, middle-aged people visited an outdoor environment to “accompany children”.

With regard to the facilities, middle-aged and young people paid more attention to facilities relevant to child-caring, such as “a children’s playground” and to “accompany children” in the CCG.

3) The Number of Family Members:

The difference mainly existed between single residents and those who had families. This variable only showed a significant influence on people’s activities.

People who had two or more family members showed a dislike for the activities to “take a shortcut” and “walk dogs” in the CCG. But single family member residents had a positive attitude to these two activities.

Compared to other residents, single family member residents showed relatively low preference levels for the activities to “do exercises”, “join some activities/events” and to “accompany children”.

4) Income:

Differences mainly existed between middle higher, high-income residents and

middle lower and low-income residents.

High and middle higher income residents were more likely to prefer a quiet environment which did not have many passers-by than low-income residents.

5) Occupation:

The main difference was between retired, unemployed residents and employed residents.

Employed residents showed a relatively lower preference for to “go for a walk” than retired and unemployed residents. They showed a greater preference for to “accompany children” than retired and unemployed residents.

Part-time and full-time job residents did not mind whether or not the design style was informal, simple and practical, while retired residents and unemployed people often preferred the design style of the CCG with these characteristics. In the same way, retired and unemployed residents strongly disagreed with an environment “without a stream or a pool” which did not get such strong opposition from the other group.

6) Education:

The differences mainly existed between the bachelor and masters degree holders and poorly educated residents.

Residents with bachelor or masters degrees were more likely to enjoy personal activities than poorly educated residents.

In terms of their attitudes to physical attributes and their perception, highly educated residents preferred an informal, natural appearance and, a simple and practical environment which evoked a quiet perception, rather than an active/vibrant environment with vivid colours, fashionable and leading and, grand design styles. Of these characteristics, the “fashionable and leading” design style often gained high preference levels from college educated background residents more than from the other three education groups.

7) Length of Residence:

Only residents who had lived there for more than a year disagreed strongly with “walking dogs”.

8) Childhood Outdoor Environmental Use Frequency

Daily users of an outdoor environment in childhood often preferred to join in some public activities (such as to “meet friends” and “join in some activities/events”) after they grew up.

At the same time, they preferred to take their children to an outdoor environment more than those infrequent childhood users. In this way, the habit of visiting an outdoor environment is passed down, generation by generation.

7.2 Demographic Characteristics of the Environmental Preference in Each City:

This section lists the results of the univariate analysis of each city, with environmental preference variables as the dependent and demographic variables as independent ones. Table 7-2 to 7-4 are the results of Shenzhen, Hangzhou and Beijing.

1. Univariate analysis of Shenzhen

Table 7-2: The results of the univariate analysis of Shenzhen

Demographic	Variables		Beta	Wald	P-value	Trend +=agree, -=disagree
Gender	V10	To go for a walk	1.04	9.224	.020	Female+
	V15	To accompany children	1.05	10.13	.001	Female+
	V32	A big children's playground with many facilities	.929	8.405	.004	Female+
Number of family members	V13	To join in some activities	.300	4.063	.044	>=2+
Income	V15	To accompany children	.549	10.9	.001	Middle lower, middle higher, high+
	V32	A big children's playground with many facilities	.62	14.7	.000	Middle higher, high+

Occupation	V32	A big children's playground with many facilities	-.447	8.08	.004	Part-time, full-time job-
	V36	A snack bar	.442	7.70	.006	Student, part-time job+
Education	V14	To do some exercises	.747	9.88	.002	College, bachelor, master or above+
	V36	A snack bar	-.495	5.21	.022	College, bachelor, master or above-
	V37	A quiet place	.715	8.89	.003	College, bachelor, master or above+
	V39	A comfortable place	.564	5.15	.023	College, bachelor, master or above+
	V43	The design style is informal	.680	8.18	.004	Bachelor, master or above+
	V44	Fashionable and leading	-.440	3.87	.049	Master or above-

2. The Univariate Analysis of Hangzhou

Table 7-3: The results of the univariate analysis of Hangzhou

Demographic	Variables	Beta	Wald	P-value	Trend
Gender	V39 A comfortable place	.553	6.06	.014	Female +
Age	V32 A big children's playground with facilities	.477	7.17	.013	Middle age and elders+
Number of family members	V31 A place with many evergreens	.26	4.97	.026	>= 3 +
Education	V15 To accompany children	.602	13.3	.000	College, bachelor, master and above+

Occupation	V34	With pergolas and pavilions	-.216	5.80	.016	Student, part-time job, full-time job -
OEUC	V34	With pergolas and pavilions	-.240	4.45	.035	Seldom-

3. The Univariate Analysis of Beijing

Table 7-4: The results of the univariate analysis of Beijing

			Beta	wald	P-value	Trend
Gender	V12	To meet friends	.585	8.21	.004	Female+
	V13	To join in some activities	.465	5.64	.017	Female+
	V18	The proportion of the natural landscape is greater than the man-made one	.502	6.35	.012	Female+
	V42	Simple and practical	.421	4.18	.041	Female+
Age	V10	To go for a walk	.736	14.4	.000	Middle age & elders +
	V32	A big children's playground with facilities in it	.479	7.97	.005	Young , middle age+
	V33	With many small squares	.765	18.5	.000	Middle age , elders+
Length of Residence	V11	To walk dogs	-.206	5.38	.020	A year, >a year-
	V14	To do some exercises	-.269	7.65	.006	A year, > a year-
	V44	Fashionable and leading	-.295	10.1	.001	A year, > a year-
Number of Family members	V28	Without natural landforms	.236	7.01	.008	2, 3, 4 +
	V33	With many small squares	-.224	5.95	.015	1,3,4-
Occupation	V10	To go for a walk	-.239	8.09	.004	Students, part-time job and full-time job -
	V43	The design style is informal	-.259	9.68	.002	Students, part-time job and full-time job--
Education	V11	To walk dogs	-.329	6.50	.011	College, master or above-
	V26	Without cars passing through	-.513	10.4	.001	College, bachelor, master or above-

V32	A big children's playground with many facilities	-.346	6.73	.009	College, bachelor-
V36	A snack bar	-.418	9.57	.002	College, bachelor, master or above-
V41	The design style is grand	-.476	12.2	.000	Bachelor, master or above-

Summary:

1) Gender Differences:

Females in Beijing like to “meet friends”, to “join some activities”. In their opinion, the environment should have a natural appearance “the proportion of the natural landscape is greater than the man-made one” and the design style should be “simple and practical”.

In Shenzhen, female residents are more likely to “go for a walk” and to “accompany children”. This is different from the activities that are preferred by Beijing female residents. This indicates that Shenzhen, as a young city, has relatively weak social ties. And Shenzhen females prefer “a big children's playground with many facilities”. This is because most young women in their child-bearing years need relevant facilities to support their needs.

In Hangzhou's female respondents' eyes, the “comfort” environment is an important factor.

2) Age Differences:

Beijing residents in middle and old age prefer to walk alone in the CCG. They like an environment with “many small squares” so that they can have a rest or do some exercises. In contrast, young and middle-aged residents often prefer the “a big children's playground with facilities” in Beijing. This situation is similar to Hangzhou.

The difference is that in Hangzhou older people help young people to look after their children rather than the young people themselves. This might be because the situation exists in this city where old people live with their adult children. This can be deduced from the statistical results in relation to the number of family members and their ages. The percentage of respondents who have three or more family

members in Hangzhou is higher than in Beijing and Shenzhen. And the average age in Hangzhou is greater than in the other two cities. So, older people can help young people to look after the grandchildren.

3) The Number of Family Members:

The residents of Beijing who have two or more family members pay less attention to the natural elements of the CCG than single people. Of these single people, the attitudinal level to “without natural landforms” was minus while this item was relatively high in the other three groups.

In Hangzhou, residents who have three or more family members pay more attention to the “evergreens” in the CCG. They prefer to see more green plants than newly married couples or single people.

In Shenzhen, respondents who were single showed, relatively, a slight preference for to “join in some event/activities” of the community in the CCG. In contrast, those who had two or more family members were more likely to join in some public activities.

4) Length of Residence

A year-long residence span is a turning point in Beijing residents’ opinion. People who have lived for up to a year were more likely to have a positive attitudes to “walk dogs” and “do some exercises”, and they liked “fashionable and leading” design styles. But for those residents with a long residence span, their attitudes were negative to these items.

5) Education:

Beijing’s residents, especially those that had a university educational background disliked the activity to “walk dogs”. They also had a relatively high preference level for “without cars passing through”, “a big children’s playground with many facilities” and had a low preference level for “a snack bar” in the CCG. The attitudinal level for the “grand” design style was negative.

Hangzhou residents who have bachelor or masters degrees were more likely to “accompany children” than their peers in the other two cities.

The educational background of Shenzhen residents influences their attitudes to many things. The differences mainly exist between residents from a secondary school background and those who have a college, bachelor or masters degree. For those people who had a college or bachelor degree, they liked to “do some exercises” in the CCG which they thought was “quiet” and “comfortable” in an “informal” design style. “Fashionable and leading” design styles were unpopular among highly educated residents, especially those with masters degrees or above.

6) Occupation:

In Beijing, the preference level of residents who were students, or in part-time and full-time jobs for “go for a walk”, was lower than retired and un-employed people’s preference levels. People’s occupations influenced their design style preference. Retired and unemployed residents preferred an “informal” design style. Compared to them, students and those residents with a job did not show a strong preference for this item.

In Hangzhou, residents who were students, or in part-time and full-time jobs showed relatively low preference levels for the facility variable - “pergolas and pavilions” in the CCG.

The situation in Shenzhen was similar to that of Beijing and Hangzhou. Compared to retired and unemployed residents, part-time and full-time job residents showed less preference for the facility variable “a big children’s playground with many facilities”. However, students and part-time job residents preferred to have a snack bar in the CCG.

This part of the analysis has shown that occupation, gender and education influence people’s preferences. These differences mainly exist between the groups of retired and unemployed residents, and employed residents, between male and female residents, between high educated and poorly educated residents.

Chapter8: The Preferred Environmental Patterns of the Residents of the HRFRAs in the Three Cities

8.1 Principle Component Analysis of the Three Cities, taken as a Whole

The principle component analysis (PCA) that the researcher undertook had two functions. The first was to explore the latent structure of the data. PCA showed groups of variables and enabled the researcher to categorise these variables, based on the correlations between them. The second was a confirmatory function, which double-checked the categorisations that had been assumed in the questionnaire.

At a general level, (taking the three cities together), the PCA was carried out with egen-values=1.4 and 0.9 respectively.

Of the two egen-values, 1.4 was selected to simply the data structure which indicated the understanding of the environment in residents' minds. Egen-value=0.9 is close to a default value 1.0. In this situation, the suppress point should be raised to 0.7 to reinforce the explanation of the component. In this study, the low egen-value (0.9) and small suppress point (.47) which were used aimed to double-check the detailed categories of the questionnaire.

The results with high egen-values identified the environmental pattern which people liked or disliked. The low egen-value PCA was used to check the correctness of the questionnaire's categories.

1) Principle Component Analysis with high Egen-Values

Table 8-1: Principle Component Analysis of the Three Cities Taken Together (with high Egen-value)

			Egen value=1.4; suppress point=0.40 38% KMO=.852
Component 1	v39	.717	A comfortable place
	v43	.636	Design style is informal
	v45	.603	Design style is suitable to the architectural style of the residential buildings

	v37	.600	A quiet place
	v31	.594	With many evergreens
	v42	.573	Design style is simple and practical
	v34	.542	With pergolas and pavilions
	v30	.523	With many plants
	v38	.492	A vibrant place
	v18	.476	The proportion of the natural landscape is greater than the man-made one
	v35	.458	With many exercise facilities
	v16	.456	To approach a natural environment
	v26	.439	Without cars passing through
Component-2	v15	.677	To accompany children
	v14	.614	To do some exercises
	v12	.584	To meet friends
	v13	.573	To join in some activities
Component-3	v28	.610	Without natural landforms
	v41	.551	Design style is grand
	v29	.533	Without a stream or a pool
	v44	.473	Design style is fashionable and leading
	v22	.465	Vivid colours
	v27	.433	Without passers-by
Component-4	v33	.591	With many small squares
	v36	.573	A snack bar
	v11	.451	To walk dogs
Component-5	v24	.583	A medium-size where I can walk around it in 15 minutes
	v23	.578	A small place where I can walk around it in 7 minutes
	v19	.512	A big lawn with tall trees
	v20		Like a forest

With a high Eigen-value of 1.4 and a suppress point at 0.40, the PCA produced five components which explained 38% of the total difference. The five components contained 29 out of 36 variables (Table 8-1). This result profiles the categories of the environmental characteristics that the residents identified in their questionnaire response and links together the physical attributes, activities and their perceptions as a whole. A designer can then use this as a point of reference to probe the internal connections between all the variables.

Because the turning point of the scree plot was at three (Chart 8-1), the first three

components were meaningful for the analysis.

The first component was headed up by the perception variable “comfort”. This component contained 13 variables from the main body of the questionnaire. Of these, people think that “informal”, “simple and practical” and “suitable to the architectural style” (from the design style category), “a quiet place” and “vibrant place” (from the perception category), “with many evergreens” and “with many plants” (from the natural elements category), “pergolas and pavilions” and “with exercise facilities” (from the facilities category), “without cars passing by” (from the area & safety category), and “the proportion of the natural landscape is greater than the man-made one” (from the bird’s-eye view category) were appropriate to the characteristic “comfort”. “To approach a natural environment” is an activity that is thought to be

connected with a sense of “comfort” by respondents. Although the correlation is not as strong as for the other environmental characteristics, this activity is the only behaviour from the activity category which shows the different relaxing nature of other necessary and social activities.

The second component consisted of five variables which came from the activity category. All these

activities had a clear goal of visiting the outdoor environment, such as to “accompany children”, to “do some exercise”, to “meet friends” and to “join in some activities”.

The third component contained different contents from the first component. The generic variable was “without natural landforms”. Respondents put “without a stream

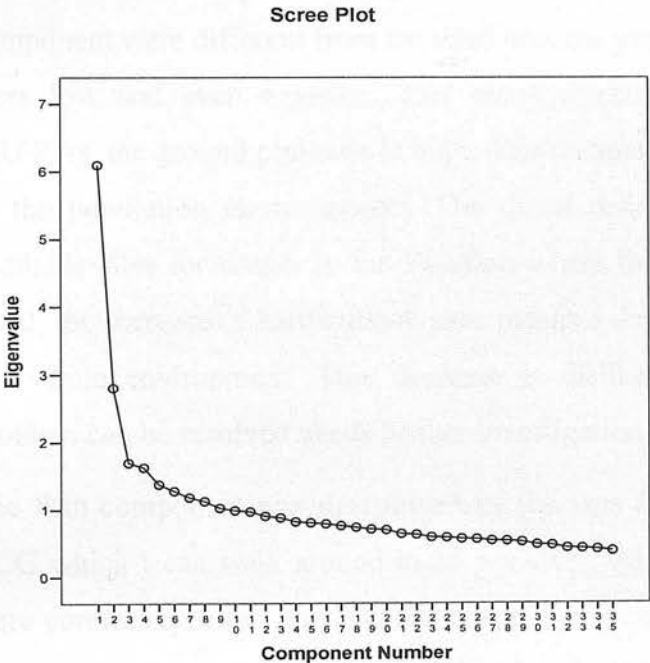


Chart 8-1: Scree plot of the PCA of the three cities taken together

or a pool”, a “grand” and “fashionable and leading” design style, a bird’s-eye view “landscape with vivid colours”, and the area & safety variable “without passers-by” under this generic variable.

In the mean analysis of the attitudinal variables from the three cities, these variables achieved low preference levels, even negative values. This PCA result clarified the links among these environmental characteristics and showed that designers need to avoid designing physical environments which might have these characteristics in residential areas, because residents dislike them, which can result in a decrease in their frequency of use. The regression analysis in Chapter 8 reinforces this result.

The fourth component was headed up by the facilities variable “with many small squares”. This component contained another two variables “with a snack bar” and the activity variable “to walk dogs” in the CCG. Although the contents of this component were different from the third one, the preference levels for these variables were low and even negative. This result creates a problem for researchers. In HRFRAs, the ground plot ratio is high. This parameter also indicates the high density of the population in the project. The direct result of this density is the lack of available sites for usage. In the situation where the area of a community garden is fixed, the increase of hard-surface sites means a decrease in the natural landscape of the whole environment. This decrease is disliked by most residents. How this problem can be resolved needs further investigation.

The fifth component was determined by the area & safety variable “a middle sized CCG which I can walk around in 15 minutes”. All the variables in this component were connected to the area and the bird’s-eye view. “Walk around in 7 minutes” is from the same category as the genetic variable of the component, “a big lawn with tall trees”; and “like a forest” comes from the bird’s-eye view category. The mean of these variables is in the middle of the whole questionnaire’s variables. From the residents’ point of view, although the variables “walk around in 30 minutes” seems a realistic environmental characteristic, it might be a goal which is difficult to reach. Compared to a large-scale outdoor environment, the size of a CCG which you can “walk around in 15 minutes” is more likely to be achieved. In residents’ views, the size of a CCG which they can walk around in 15 minutes often correlates to the

appearance of “a big lawn and tall trees”, or even “like forest”.

2) Principle Component Analysis with Small Eigen-Values

Table 8-2: Principle Component Analysis of the Three Cities Taken Together (with small Eigen-value)

			Eigen value=0.9; suppress point=0.45 59%
Component-1	V43	.764	The design style is informal;
	V39	.671	A comfortable place to sit outside
	V45	.658	The design style is suitable to the residential buildings
	V37	.607	A quiet place
	V42	.605	The design style is simple and practical
	V34	.455	Pergolas and pavilions
Component-2	V15	.742	To accompany children
	V14	.634	To do some exercises
	V16	.551	To approach a natural environment
Component-3	V44	.693	The design style is fashionable and leading
	V40	.645	An interesting place
	V41	.613	The design style is grand
	V38	.562	A vibrant place
Component-4	V28	.800	A place without natural landforms
	V29	.724	Without a stream or a pool
Component-5	V33	.732	Many small squares
	V32	.670	A big children's playground with facilities
	V35	.475	Many exercise facilities
Component-6	V21	.705	The CCG in a geometric pattern
	V22	.648	The CCG with vivid colours
Component-7	V30	.782	With many plants
	V31	.644	With many evergreens
Component-8	V24	.802	A medium-size I can walk around in 15 minutes
	V23	.656	A small place I can walk around in 7 minutes
Component-9	V17	.751	To take a shortcut
	V36	.482	A snack bar in it
Component-10	V13	.776	To join in some activities
	V12	.676	To meet friends
Component-11	V25	.785	A large place where I can walk around it in 30 minutes
	V20		The CCG is like a forest

Component-12	V27	.667	A place without passers-by
	V11	.555	To walk dogs

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 14 iterations.

PCA analysis with a low egen-value of 0.9 obtained a detailed categorisation of the variables. There were 12 components, which explained 59% of the total variances (Table 8-2). The 12 components contained 31 variables.

In most situations, each component only contained variables from one category of the questionnaire. Although the contents of the components that resulted from a low egen-value is narrower than from the high one, most of the components (egen-value=0.9) only contained the variables from one category of the questionnaire. This suggested that the original categories of the environmental elements were correct. Table 8-2 above shows the results.

In the first component, all the variables came from the perception & design style section. They were “informal”, “suitable to the architectural style of the residential buildings” and “simple and practical”, which came from the design style category, and a “comfortable place” and “a quiet place”, which came from the perception category.

The second component consisted of the activity variables. To “accompany children”, “to do some exercises” and “to approach a natural environment”, they all came from that category.

The third component included “fashionable and leading”, a “grand” design style, “an interesting place” and “a vibrant place”, which came from the perception category. Just as the component obtained an egen-value of 1.4, the variables in this category got low preference levels in contrast to the “informal” and “comfort” environmental preferences.

The fourth component consisted of two variables from the natural element category, “without natural landforms” and “without a stream or a pool”.

The fifth component included three variables from the facilities category: “ with

many small squares”, “with a children’s playground and facilities” and “with many exercise facilities” in the CCG.

The sixth component had two bird’s-eye view variables: “a garden in a geometric pattern” and a “landscape with vivid colours”. Both of them did not get high preference levels.

The seventh component was composed of two variables from the area & safety category: “walk around in 15 minutes” and “walk around in 7 minutes”.

The eighth component contained two variables that came from different categories: to “take a shortcut” from the activity category and “with a snack bar” from the facilities category. Both recorded low preference levels.

The ninth component contained “to join some activities” and “to meet friends” which were from the activity category.

The last component had two variables, “a place without passers-by” from the area & safety category and “to walk dogs” from the activity category. There was no strong link between the two variables. The correlation might imply that the dog owners wanted to visit an environment without being disturbed by other people, given that most of the outdoor environment visitors had a negative attitude to “walking dogs” in a small outdoor environment.

Summary:

Lyndon (2007, p.3) states that “good places are sticky...they attract and hold associations for those who live among them”. Designing an attractive environment comprises many aspects, which are often presented as reflecting the preferences of the users. In the researcher’s investigation, principal component analysis simplified the contents of place and reconstructed them, based on the internal correlations. The PCA results from the PCA showed that the components can support designers’ work in helping them to extract corresponding features, according to residents’ preferences, so that they will build an environment which HRFRA residents will prefer and which will be ‘sticky’ and attractive for those who live in it.

1) The “comfort” environment:

The “informal”, “simple and practical” design-style, perspectives, where “the proportion of the natural landscape is greater than a man-made one” and the design style is “suitable to residential buildings”, all improve people’s positive perceptions.

Physical attributes such as “evergreens”, “many kinds of plants” and facilities such as “pergolas and pavilions” and “exercise facilities” make residents feel comfortable and facilitate people’s use. Although vehicle traffic in the CCG does not reduce people’s actual use significantly, residents keep safety in mind because it decreases their perception of “comfort”, which includes two paradoxical perceptions, namely, a sense of “quiet” and “vibrancy”. These component loadings showed that both of these two feelings correlated to comfort positively.

2) The environmental elements which people dislike:

The second group of PCA results showed a different picture from the “comfort” one. In this second group, “without a natural landform”, the “design style is grand”, “without a stream and a pool”, the “design style is fashionable and leading”, “vivid colours” and “without passers-by” delineated an environment which residents disliked. Residents often categorised an excessive artificial environment which lacks natural elements as belonging to a formal, grand design style. A fashionable and leading design style with vivid colours often evoked people’s view of it as lacking natural elements in the environment.

8.2Principle Component Analysis at the City Level

8.2.1 Factor Analysis Results For Beijing

Table 8-3 shows the PCA results for Beijing with egen-value=1.4 and suppress point=.46. Fifty-nine per cent variance could be explained by the six components.

Table 8-3: Principle Component Analysis of Beijing

	With Egen-value=1.4, KMO =0.807, Suppress point=0.4, six components totally explained a total of 42.6% variances.	
Component 1	A comfortable place	.701
	A quiet place	.629
	The design style of the CCG is informal	.619

	The design style of the CCG is suitable to the style of the residential buildings	.616
	A place with many evergreens	.603
	The design style of the CCG is simple and practical	.553
	The CCG has pergolas and pavilions in it	.550
	The proportion of the natural landscape is greater than the man-made one	.484
	A place with many plants	.468
Component 2	Trees, architecture and squares of the CCG with vivid colours	.696
	An interesting place	.681
	The design style of the CCG is fashionable and leading	.625
	The design style of the CCG is grand	.613
	A garden in a geometric pattern	.542
	A vibrant place	.412
Component 3	To accompany children	.725
	To do some exercises	.654
	To meet friends	.589
	To join in some activities	.536
	To approach a natural environment	.479
	To go for a walk	.435
Component 4	A big lawn with some trees	.581
	The CCG is like a forest	.569
	A small place where I can walk around it in 7 minutes	.564
	A medium-sized place where I can walk around it in 15 minutes	.485
Component 5	With many small squares in the CCG	.665
	With many exercise facilities in the CCG	.569
	A big children's playground with many facilities	.436
Component 6	A place without natural landforms	.749
	A place without a stream or a pool	.639
	A place without passers-by	.429

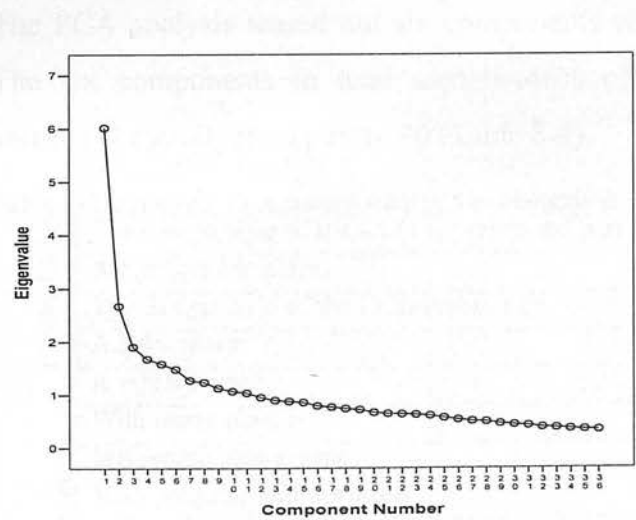


Chart 8-2: Scree plot of PCA , Beijing

The first component comprised nine variables under the generic variable “comfort”. Of these nine, five out of nine came from the perception and design-style section. A quiet, simple and practical environment with an informal design style was preferred by the residents. In this

environment, natural elements including “many plants” and “many evergreens”, often make people feel better than those without them. The facility “pergolas and pavilion” and the bird’s-eye view variable “the proportion of the natural landscape is greater than the man-made one”, can reinforce residents’ sense of comfort in an environment.

The second component was concerned with the physical attributes of the CCG “in vivid colours” which might imply that the grand, fashionable and leading design styles were in Beijing residents’ minds. These variables often correlate to an interesting and vibrant sense of the environment.

Component 3 consisted of variables from the activity category.

Component 4 contained four variables from the bird’s-eye view category and the area and safety category of the CCG. The preferred view of a small or medium-sized CCG was often reflected as “a big lawn with tall trees” or a high density of trees which made the CCG looks “like a forest”.

Component 5 only included the facilities’ variables.

Component 6 included two natural element variables, “without natural landforms” and “without a stream or a pool”. In residents’ opinions, an outdoor environment without natural landforms and waterscapes would not attract users. The lack of users was reflected as “without passers-by”.

8.2.2 Factor Analysis Results for Hangzhou

The PCA analysis teased out six components which included 28 variables in total. The six components in total explain 46% of variance, with KMO=.803, Eigen value=1.4 and suppress point=.40 (Table 8-4).

Table 8-4: Principle Component Analysis of Hangzhou

Component 1	The design style of the CCG is simple and practical	.714
	A comfortable place	.646
	The design style of the CCG is informal	.620
	A quiet place	.548
	A vibrant place	.546
	With many plants	.513
	With many evergreens	.508
	With pergolas and pavilions	.502
	The design style of the CCG is fashionable and leading	.487

Component 2	A place without a stream or a pool	.680
	A place without natural landform	.623
	The design style of the CCG is grand	.613
	The design style of the CCG is suitable to the style of the residential buildings	-.444
	With many exercise facilities	-.425
Component 3	To go for a walk	.698
	The proportion of the natural landscape is greater than the man-made landscape	.689
	To meet friends	.565
Component 4	Trees, architecture and squares of the CCG with vivid colours	.660
	An interesting place	.654
	A garden in a geometric pattern	.601
	A place without passers-by	.489
Component 5	A big children's playground with facilities	.662
	With many small squares	.626
	With a snack bar	.476
	To walk dogs	.453
Component 6	A medium-sized place where I can walk around it in 15 minutes	.729
	A big lawn with some tall trees	.707
	A small place where I can walk around it in 7 minutes	.612

The first component had at the top of its list a design style that was “simple and practical”, followed by a sense of comfort and an informal design style. The facility “pergolas and pavilions”, and the natural elements “many plants” and “many evergreens” were the constituents of this component. Hangzhou residents also preferred a place that was “quiet” as well as a place that was “vibrant”, and a “fashionable and leading” design style.

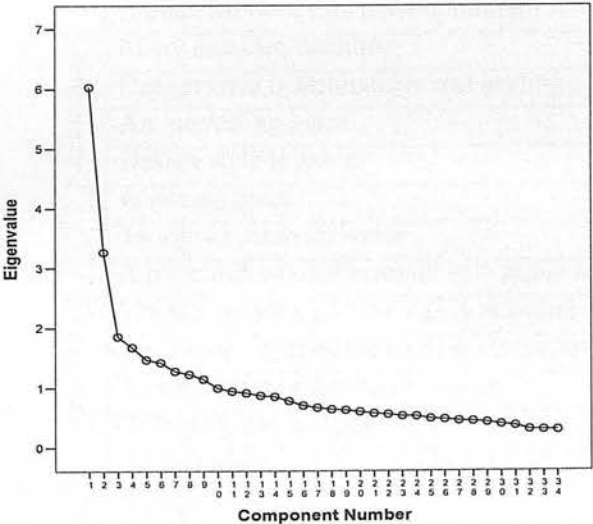


Chart 8-3: The Scree plot of PCA , Hangzhou

The third component had at the top of its list the activity “to go for a walk” followed by “to meet friends”. The environment that was suitable for these activities was “the

proportion of the natural landscape is greater than the man-made one”.

The fourth component included four variables. An environment with “vivid colours” often meant that the composite structure of the CCG is “geometric”. In the residents’ opinion, it is the expression of “fashionable and leading”. There were not too many visitors in this kind of environment (without passers-by).

The fifth component was composed of three variables from two categories. The preferred view of a small or medium-sized CCG was “a big lawn with some tall trees”.

8.2.3 Factor Analysis Results for Shenzhen

The PCA analysis of Shenzhen teased out seven components with KMO=.687, Eigen value=1.4, suppress point =0.4. The seven components explained 51.4% variance in total (Table 8-5).

Table 8-5: Principle Component Analysis of Shenzhen

Component 1	The proportion of the natural landscape is greater than the man-made landscape	.684
	To accompany children	.587
	To approach a natural environment	.572
	A quiet place	.550
	To go for a walk	.489
	To do some exercises	.462
	A big lawn with some trees	.431
	A place without cars passing through	.420
Component 2	Many exercise facilities	.658
	Design style is fashionable and leading	.635
	An interesting place	.579
	Design style is grand	.541
	A vibrant place	.505
	To join in some activities	.449
	A big children’s playground with many facilities	.409
Component 3	The design style of the CCG is informal	.710
	The design style of the CCG is simple and practical	.635
	A comfortable place to sit outside	.564
	With pergolas and pavilions	.518
	A quiet place	.416
Component 4	A place with many plants	.728
	A place with many evergreens	.700
	A garden in a geometric pattern	.485
	The CCG looks like a forest	.475

	Trees, architecture and the squares of the CCG with vivid colours	.472
	A large place where I can walk around it in 30 minutes	.442
Component 5	A place without a stream or a pool	.791
	A place without natural landform	.672
Component 6	With many small squares	.769
	With a snack bar	.593
	To take a shortcut	.496
Component 7	A small place where I can walk around it in 7 minutes	.751
	A medium-sized place where I can walk around it in 15 minutes	.655
	To go for a walk	-.448
Component 8	A place without passers-by	.617
	To meet friends	-.461
	To walk dogs	.443
	To join in some activities	-.434

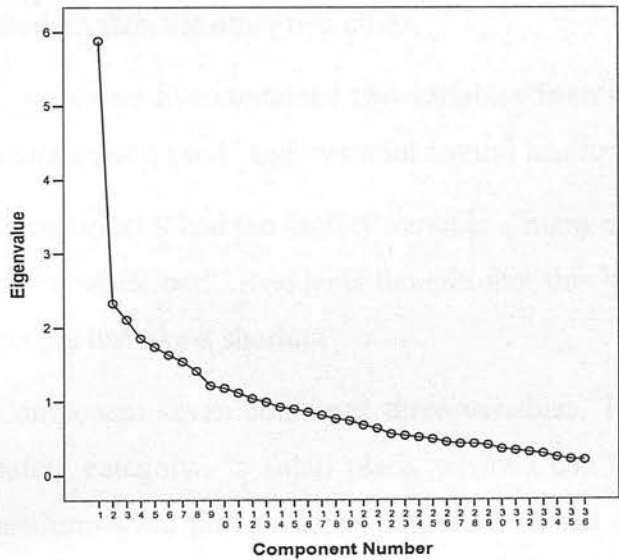


Chart 8-4: The Scree plot of PCA , Shenzhen

“approach a natural environment”, to “go for a walk” and, to “do some exercises” in an environment with these characteristics. And the “quiet” sense of place correlated to the natural appearance of the environment for this component.

The second component had “exercise facilities” first, followed by “a big children’s playground with facilities”. These physical attributes suited people, allowing them to “join in some activities/events”. An environment with these facilities often makes people feel “fashionable and leading”, “interesting”, and “vibrant”. The “grand”

The first component had at the top of its list the bird’s-eye view variable, “the proportion of the natural landscape is greater than the man-made landscape”, which was followed by the other bird’s-eye view variable, “a big lawn with tall trees” and the safety variable, “without cars passing through”. Residents preferred activities such as to “accompany children”, to

design style also correlated to this kind of environment.

Component 3 included five variables with generic variables from the design style category - “informal”. In Shenzhen residents’ minds, an “informal” design style correlated to a “simple and practical” design style, one that was “comfortable” and that created a “quiet” perception of an environment. Facilities such as “pergolas and pavilions” belong to this component.

The fourth component had with “many plants” at the top of its list, and from the natural element category included the variable -“with many evergreens”. For many residents, many plants correlated to the appearance of an environment that is “like a forest” and where the size is “a large place where I can walk around it in 30 minutes”. Unlike Hangzhou and Beijing residents, Shenzhen residents thought that “a garden in a geometric pattern” and with “vivid colours” correlated to the plants of the CCG. This might be because the landscape design style of Shenzhen is more modern than the other two cities.

Component five contained two variables from the natural element category “without a stream or a pool” and “without natural landforms”.

Component 6 had the facility variable -“many small squares” top of its list, followed by “a snack bar”. Residents thought that this kind of environment might encourage people to “take a shortcut”.

Component seven contained three variables. Two of them were from the area and safety category -“a small place, where I can walk around it in 7 minutes” and “a medium-sized place where I can walk around it in 15 minutes”. The activity to “go for a walk” was not suitable to the small and medium size of the CCG (the component loading of the activity to “go for a walk” was in negative correlation to the small and medium-sized CCG).

Component 8 had headed up by “a place without passers-by” top of its list, which came from the area and safety category. An activity that was suitable to this environment was to “walk dogs”. Residents disliked “to meet friends” and “to join in some activities” in an environment where there were few people.

Summary:

The factor analysis results showed that the preferred environmental patterns of Hangzhou and Beijing had more commonalities than Shenzhen. This was expressed in the variables of the components which correlated to the generic variables.

1) Similarities:

Across the three cities, the similarities were residents' understanding of "comfort". The perceptions, "quiet", "informal", "simple and practical" design styles correlate to the sense of "comfort". This kind of environment often has a suitable rest facility for rest- "pergolas and pavilions".

The second similarity was that "vivid colours" correlates to the "geometric" composite structure of the CCG and often gives residents a sense that the CCG is "interesting". It is a modern design style which is different from the Chinese traditional garden. People in the three different cities have the same opinion about this point.

Both similarities are reflected in the general PCA results.

2) Differences:

Shenzhen residents have a different understanding of "plants". In their view, plants often correlate to a "geometric pattern" and "vivid colours". This correlation is quite different from Beijing and Hangzhou, whose residents often draw a correlation from plants to the quiet and comfortable features of an environment and one which excludes active elements.

The fact that the Shenzhenese have a different understanding of plants from the other two cities might be because Shenzhen is a modern, young city, where bright and lively colours can often be seen in the urban environment. Shenzhen residents prefer a "fashionable and leading" design style. Different to Shenzhen, Beijing and Hangzhou, on the other hand, have a long history and look for a harmonious relationship with their surrounding areas. The colours which are often used in these two cities are grey, beige, brown and white. This characteristic can be seen from the cityscape. The other reason is that Shenzhen has a tropical climate which is suitable for plant growing. Thus their plant resources are greater than the other two cities.

Landscape architects have more material to create the environment.

All the three cities' respondents had strong views about the CCG "without natural landforms" and "without a stream or a pool". Hangzhou residents link them to a "grand" design style, and think that they are "unsuitable to the architectural style of residential buildings", while for Beijing residents, "without natural landforms" and "without a stream or a pool" means an environment "without passers-by". Both Beijing and Shenzhen had a negative understanding of an the environment without natural landforms and waterscapes.

Chapter 9: An Investigation of Demographic and Attitudinal Variables Discriminating Use of the CCG

The physical environment influences people's behaviour. To probe the effects of the environment on people's actual use, a series of analyses were carried out.

The analysis has been divided into two sub-sections-preliminary analysis and logistic regression analysis, with actual use as the target variable.

In the preliminary analysis, the characteristics of the frequency of use have been identified according to residents' demographic backgrounds.

In the logistic regression analysis section, environmental elements which significantly influence people's actual use were teased out. There were three that steps had to be followed. Firstly, data screening sifted out the variables in which user groups differed significantly. The regression analysis in the second step identified the predictors of outdoor environmental use from the variables obtained from the data screening. Answer-tree analysis was undertaken to sequence the significant variables in the third step to deepen the understanding of the results of the second step.

As a result of all this analysis, a hierarchy was arrived at that showed the effectiveness with which each place characteristic discriminated frequent users from infrequent users, with people's actual use as the criterion.

These analyses were undertaken, for the three cities together, and at the individual city level.

9.1 An investigation of demographic and attitudinal variables discriminating use of the CCG at general level (three cities together)

9.1.1 Demographic characteristics discriminating use of the CCG

9.1.1.1 Demographic characteristics discriminating use of the CCG (for all three cities)

1) Gender

Distribution of the frequency of use among the gender groups (for all three cities)

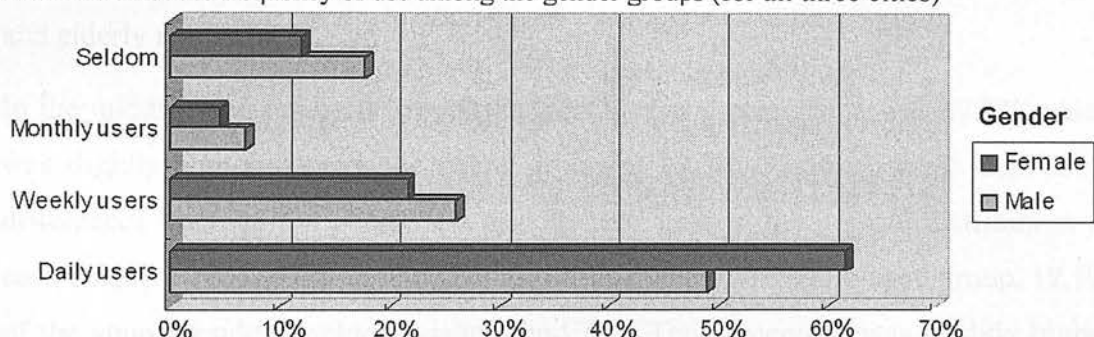


Chart 9-1

There was a significant difference between male and female outdoor environmental users (Chi-square=35.1, P-value=.001). 61% of female residents reported visiting an outdoor environment on a daily basis, which is a greater percentage than for the males, at 49.1% (Chart 9-1). In the less frequent user groups, the percentage of male residents was always higher than for the females (26.1% male weekly users vs 21.7% females, 7% male monthly users vs 4.6% female, 17.8% males, rarely users vs 12% females).

2) Age

The differences between the different age groups reached significant levels (Chi-square= 10.12, P-value= .017). For the three age groups, each percentage of daily users was more than 50%. This proportion was much higher in the group of elderly people, at 82.1% (Chart 9-2).

Distribution of the frequency of use among the age groups (for all three cities)

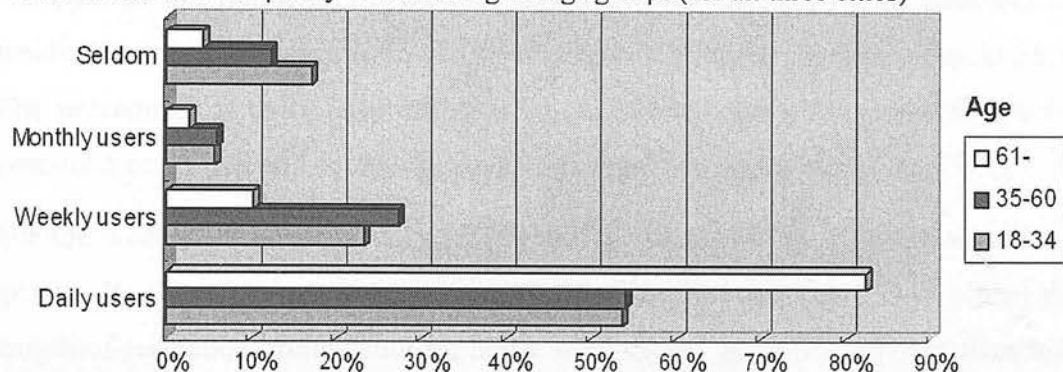


Chart 9-2

In the weekly and monthly user groups, the percentages for the middle aged and young residents was higher than for the elderly people. Compared to young people, middle-aged residents were more likely to be weekly and monthly users. The percentage of seldom users among the young people was higher than for middle-aged and elderly residents.

In the middle-aged residents group, the weekly users' percentage was 27.3% which was slightly higher than for the young group, at 23.3%. Although there were some differences between the young and middle-aged groups, the general distribution of each frequency of use group was similar. Compared to the middle-aged group, 17.1% of the young residents seldom visited the CCG. The percentage was slightly higher than for the middle-aged residents, at 12.3%.

3) Length of Residence

Distribution of the frequency of use among the length of residence groups (for all three cities)

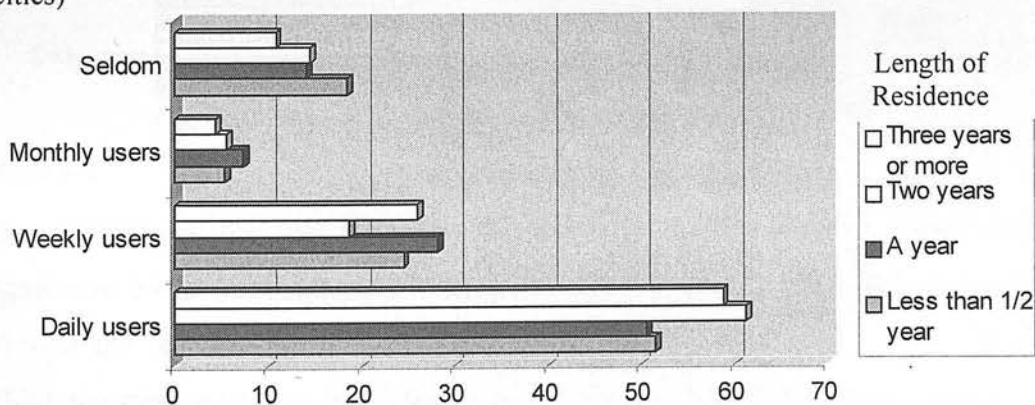


Chart 9-3

There were significant differences between the length of residence groups in

response to the frequency of outdoor environmental use. 61.3% of two-year-long residents were daily users, followed by residents with three years or more, at 58.8%. The percentage of daily users in other length-of-residence groups was 50.6% for a year-long residency and 51.6% for those with less than half a year (Chart 9-3).

For the weekly user group, only 18.7% of the two-year-long residents were in this group. It was the lowest percentage of the four groups. The other three length-of-residence groups showed some similarities, at 24.5% for less than half a year, 28.2% for a year and 26% for three years or more.

There was not much difference among each length-of-residence group in terms of the percentage of monthly users. But the percentage of seldom users among each length-of-residence groups was different. 18.5% of residents whose length of residence was for less than half a year rarely visited the CCG. This percentage was the highest of the four length-of-residence groups. Three-year-long residents had the lowest percentage of seldom users in their group, at 10.8%. The other two groups had 14.1% for a year-long, and 14.4% for a two-year-long residency.

4) Income

Distribution of the frequency of use among the Income groups (for all three cities)

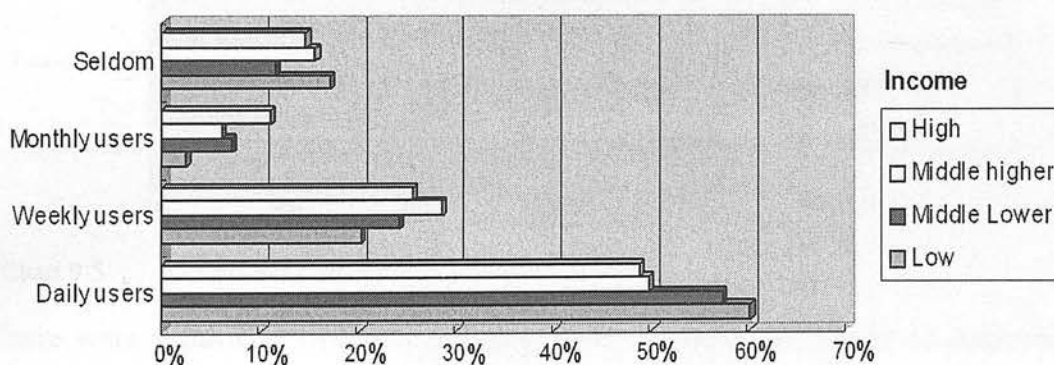


Chart 9-4

The differences for the frequency of use among the income groups reached significant levels (Chi-square=13.64, P-value=.003). Daily users made up more than 55% of the respondents in the middle lower and low income groups respectively, while the percentage of daily users in the middle higher and high income level groups was relatively low, at about 48% (Chart 9-4).

There was a big difference between the low and middle lower income groups, and

the middle higher and high income groups. The percentage of frequent users in the relatively high income groups (middle higher and high income groups) was lower than for those in the lower income groups. The percentages were 49.7% (middle higher) and 48.8% (high), compared with 57.3 % (middle lower) and 60.1% (low).

Among the middle higher and high income residents, weekly users made up 28.5% and 25.6%, respectively. These percentages were higher than for the other two relatively low income groups, in which the percentage of weekly users made up less than 23%.

However, 17.1% of residents from low income groups seldom visited the CCG. It had the highest percentage compared to the other income groups. The percentage of seldom users of the CCG in the middle higher and higher income groups was 15.6% and 14.6%, respectively.

5) Occupation

Distribution of the frequency of use among the occupation groups (for all three cities)

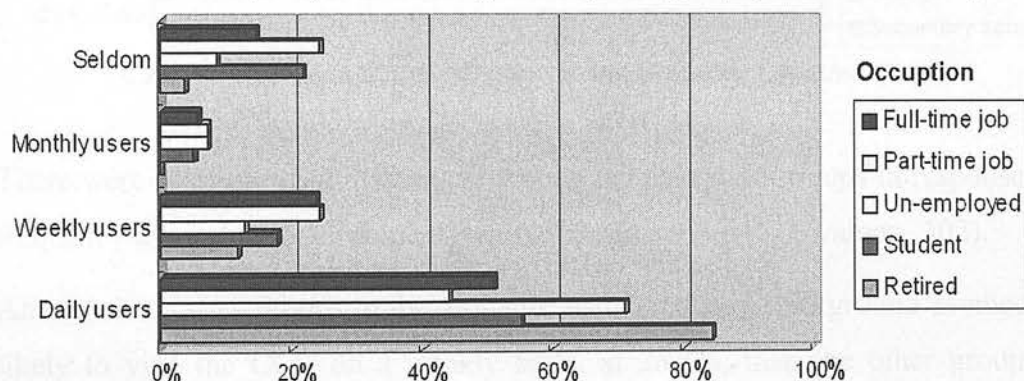


Chart 9-5

There were significant differences between the occupational groups in response to the frequency of outdoor environmental use (Chi-square=29.2, P-value=.000).

The proportion of daily users among the retired residents was the highest, at 84.4%, followed by the unemployed at 71%. Although the part-time job residents had the freedom to manage their time, it seems that they disliked visiting outdoor environments frequently. Only 44.1% of part-time job residents were in a daily user group. It was the lowest one across all the occupational groups (Chart 9-5).

The part-time job residents' group had the highest percentage of rare users at 24.3%,

While the percentage of daily users among the full-time and part-time job respondents was lower than for retired and unemployed residents, employed residents were more likely to be weekly users than retired, unemployed residents and students. The percentages were 24.3% for part-time job residents and 23.7% for full-time job residents, while the percentages for the other occupational groups were lower than 17%.

6) Education

Distribution the frequency of use among the education groups (for all three cities)

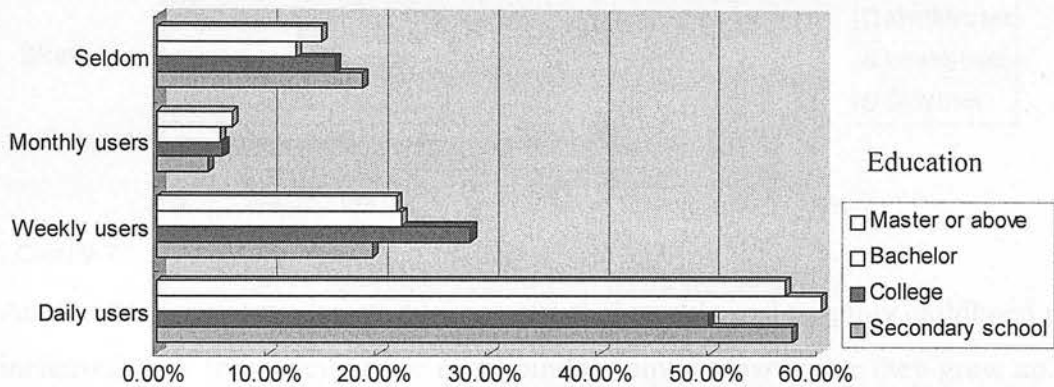


Chart 9-6
There were no significant differences among the education groups in response to the frequency of outdoor environmental use (Chi-square=3.645, P-value= .302).

Among these user groups, only residents with a college background seemed more likely to visit the CCG on a weekly basis, at 28.3%, than the other groups. The percentage of daily users in this group is the lowest one (49.8%), compared to others (Chart 9-6).

7) Frequency of use of the Outdoor Environment in childhood

The differences between groups for the frequency of use of the outdoor environment in childhood reached significant levels (Chi-square=98.83, P-value=.000). The childhood visiting frequency was in line, positively, with the adult frequency of use. The more frequently the respondent had visited an outdoor environment as a child, the more likely he/she was to visit an outdoor environment frequently as an adult.

65.6% of childhood daily users visited an outdoor environment on a daily basis after

they grew up. Among those who rarely used the outdoor environment as a child, 45.2% of them seldom visited a natural environment in adulthood (Chart 9-7). So too did the monthly users. There were 14.6% monthly users in childhood who became monthly users as adults. This percentage was much lower than for the correlations between the daily and seldom users and their corresponding behaviour as children.

Distribution of the frequency of use among the groups that used the outdoor environment in childhood (for all three cities)

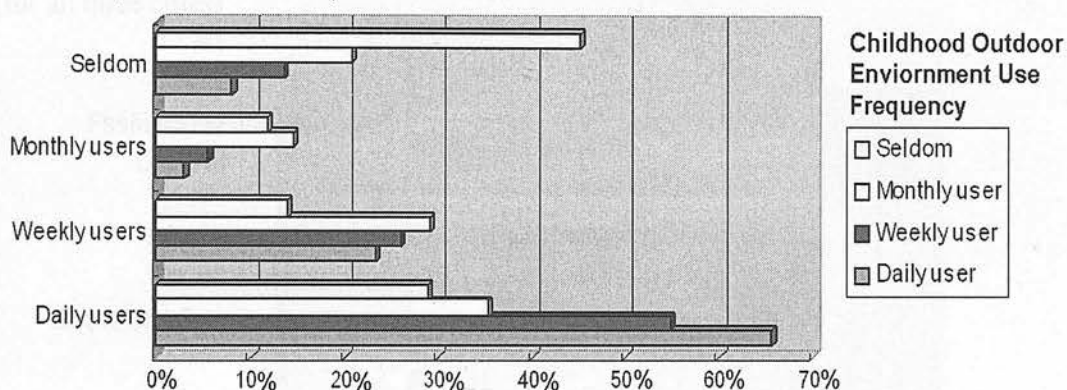


Chart 9-7

Another tendency was discernible, namely, that weekly and monthly childhood users increased their frequency of use of an outdoor environment after they grew up. For childhood weekly users, they were more likely to be daily users, at 54.8%. Only 26.1% of them kept their childhood habit of visiting the CCG on a weekly basis. This situation happened in the childhood monthly user group as well. 29.2% of the childhood monthly users became weekly users and 35.4% became daily users when adult. This proportion was much higher than the 14.6% for the childhood monthly users who kept their habit as adults.

Generally speaking, though the frequency of use in childhood of an outdoor environment correlated to the adult one, the correlations were stronger among those daily and rare user groups than for the other groups.

Childhood weekly and monthly users often increased their frequency of use of the outdoor environment as adults. This might be for a variety of reasons. A compact indoor domestic environment and a noisy urban environment tend to make people want to pursue relaxation in a natural environment for health purposes. A nearby outdoor environment can increase this kind of opportunity and offer the required facilities for this purpose. The other reason might be to seek an improvement in

Chapter 9: An Investigation of Demographic and Attitudinal Variables Discriminating Use of the CCG

living conditions. With the quality of the outdoor environment increasing, more and more people want to make use of their spare time to enjoy the natural environment, or to increase their social interaction with other residents.

9.1.1.2 Attitudinal Variables Discriminating the Use of the CCG

Attitudinal levels of the different user groups in response to activity and design style categories (for all three cities)

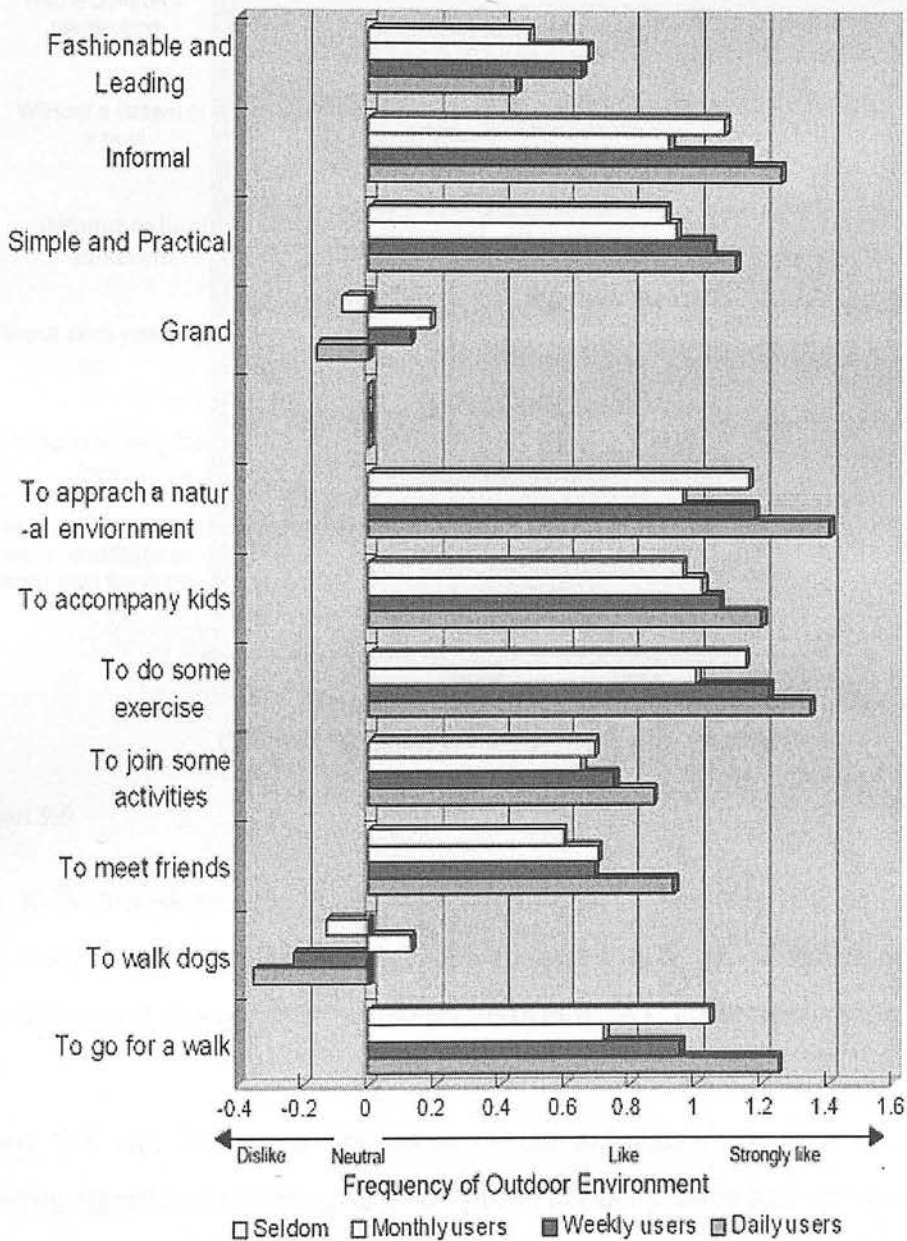


Chart 9-8

Attitudinal levels of the different user groups in response to physical attribute variables (for all three cities)

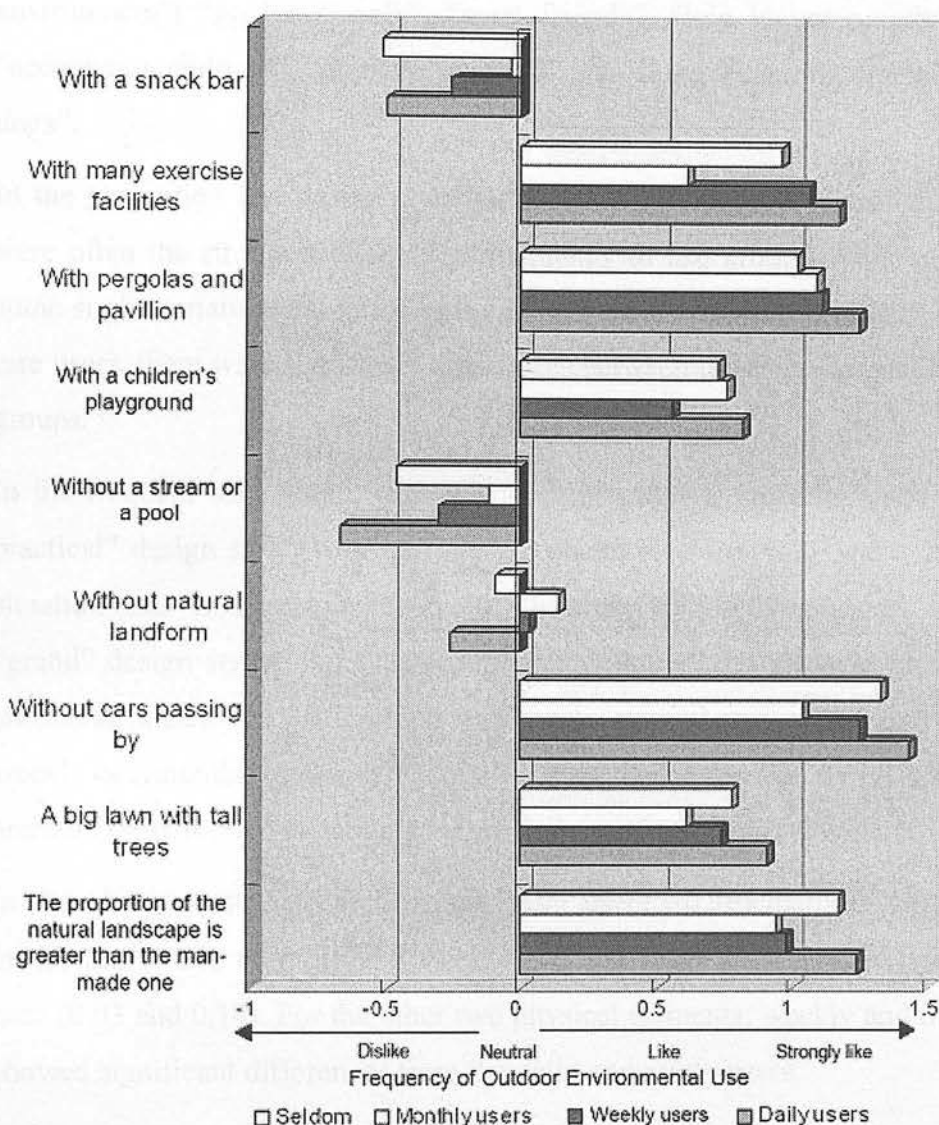


Chart 9-9

The K-W test shows that there were significant differences between the different frequency of use groups in response to many activity, physical attributes and perception and design style variables. Appendix 9-1 shows the results of the K-W test.

Charts 9-8 and 9-9 reveal the mean of the attitudes from different user groups showing significant differences. They show that daily users had differences with the other user groups in most situations.

In the activity group, the absolute attitudinal levels of the frequent users were higher

than for the other three user groups. Frequent users preferred to “approach a natural environment”, “go for a walk”, “meet friends”, “join in some activities/events”, “accompany children”, “do some exercise” and showed a strong dislike for “to walk dogs”.

In the perception and design style section, the attitudinal levels of the daily users were often the strongest of the four frequency of use groups. Although there were some slight variations, in terms of the attitudinal levels for the weekly, monthly and rare users, there were significant differences between these groups and the daily user groups.

In the frequent user group, respondents preferred the “informal” and “simple and practical” design style, with average attitudinal levels of 1.12 and 1.26, while this situation was reversed for people’s attitudes to “fashionable and leading” and “grand” design styles. For “fashionable and leading” design style, the daily users’ attitudinal mean was 0.45, which was much lower than the 0.65 and 0.67 for the weekly and monthly users, respectively. In particular, “grand” (with a mean of 0.13 and 0.19) was viewed negatively by the daily and rare users (-0.16 and -0.08).

In the physical attribute section, the daily users (-0.26) disliked “without natural landforms” while monthly and weekly users showed a slightly preference for this item (0.03 and 0.14). For the other two physical elements, weekly and monthly users showed significant differences from the daily and rarely users.

The preference levels for “snack bar” were -0.5 and -0.52 for the daily and rare users, while for weekly and monthly users they were -0.26 and -0.04. The frequent users were more likely to dislike this item than those the less frequent users.

For “without a stream or a pool”, the attitudinal level of the daily users was -0.26, for the other three groups it was 0.03 (weekly users), 0.14 (monthly users) and -0.09 (rare users).

This section aims to tease out the environmental characteristics which had significant influences on residents’ actual use. A series of logistic regressions were carried out with the frequency of use of the outdoor environment as the dependent variable. To avoid interference from the other two sections, the influence of the respective place

9.1.2 Predictors of Actual use for all Three Cities as a Whole

9.1.2.1 Predictors from the Demographic Section

In the demographic section, the predictive model was approximate with the data (Chi-square=2.829, P-value=.945). With a 63.9% accuracy rate (Appendix 9-2), four significant predictors were identified.

Gender, length of residence, occupation and childhood frequency of use in childhood of an outdoor environment were four predictors which had a significant influence on the frequency of use as an adult.

Among gender groups, female residents were more likely to use the outdoor environment frequently than male residents (Wald=16.56, P=.000, Exp(b)=1.84).

So too for length of residence (Wald=4.32, P=.037, Exp(b)=1.165). The longer the residents had lived in an area, the more likely they were to visit the CCG frequently.

The relationship between occupation and the frequency of use is negative. People's frequency of outdoor environmental use decreased with the increase in their work time (Wald=28.23, P=.000, Exp(b)=.719). Students, part-time and full-time job residents did not visit the CCG as frequently as retired and un-employed residents.

The relationship between frequency of use in childhood of an environment was in line with that of adult frequency of use (Wald=57.24, P=.000, Exp(b)=.555). People keep their childhood habits after they grow up. Daily users seemed to be daily adult users, weekly users seemed to be weekly adult users, and so on. (The detailed demographic characteristics of each frequency of use group was described in the first section of this chapter.)

9.1.2.2 Predictors from the Activity Section

With 59.9% of the overall correct classification, the model that consisted of the activity predictors was approximate to real data (H&L test: Chi-square =6.56, P-value=.584) (Appendix 9-3).

In this section, “go for a walk” (Wald=8.63, $P=.003$, $\text{Exp}(B)=1.33$), “to walk dogs” (Wald=5.06, $P=.024$, $\text{Exp}(B)=.874$), “to meet friends” (Wald=11.58, $P=.001$, $\text{Exp}(B)=1.43$) and “approach a natural environment” (Wald=6.44, $P=.011$, $\text{Exp}(B)=1.43$) were four predictors of the frequency of outdoor environmental use. Except for “to walk dogs”, the other three activities were preferred by residents and could increase their outdoor environmental use.

9.1.2.3 Predictors from the Physical Attributes Section

In the physical attribute section, the null hypothesis can be accepted (Chi-square=10.82, $P\text{-value}=.212$) (Appendix 9-4).

Three predictors were obtained: “a lawn with tall trees”, from the bird’s-eye view category, “without natural landforms” and “without a stream or a pool” from the natural elements category.

“A lawn with tall trees” could increase people’s frequency of outdoor environmental use (Wald=5.438, $P\text{-value}=.02$, $\text{Exp}(b)=1.21$).

The other two items have negative effects on residents’ frequency of outdoor environmental use. The parameters for “without natural landforms” were Wald=6.732, $P\text{-value}=.009$, $\text{Exp}(b)=.815$, and for “without a stream or a pool”, they were Wald=8.478, $P\text{-value}=.004$, $\text{Exp}(b)=.798$. People disliked it if the outdoor environment lacked natural elements, especially natural landforms and waterscapes. And natural landforms seemed to have greater importance than the waterscape, given their respective influence on frequency of use ($\text{Exp}(b)=0.815$ and 0.798).

9.1.2.4 Predictors from the Perception & Design Style Section

The null hypothesis has been rejected (Chi-square=46.04, $P\text{-value}=.012$) (Appendix 9-5). Although there was a significant difference between the model and the data, predictors from this section could give designers some useful information.

“Grand”, “simple and practical” and “suitable to the architectural style of residential buildings” were three items which had a significant influence on people’s frequency of use of an outdoor environment. Of these, “grand” had a minus effect

(Wald=42.818, P-value= .000, Exp(B)=.574). "Simple and practical" (Wald=11.946, P-value=.001, Exp(B)=1.532) and "suitable to the architectural style of residential buildings" (Wald=7.92, P-value=.005, Exp(B)=1.335) could increase people's outdoor environmental use.

Summary:

1. General summary:

1) The predictors of the frequency of use of the outdoor environment were obtained for the four activities, and the three physical attributes.

Of these, social activities such as "to meet friends", and optional activities like "to go for a walk" and "to approach a natural environment" increase people's frequency of use, while "to walk dogs" had a negative influence on it.

The physical attributes "without a stream or a pool" and "without natural landforms" decreased people's frequency of use. The outlook "a big lawn with tall trees" increased people's actual use.

Of the perception and design style, "grand", "simple and practical" and "suitable to the architectural style of the residential buildings" were three predictors of residents' use. Apart from "grand" design style, the other two factors increased residents' frequency of use of the outdoor environment.

Gender, length of residence, occupation and frequency of use in childhood of an outdoor environment were four significant predictors of actual use. Of these four variables, females were more likely to use the outdoor environment frequently than males. In the length of residence groups, the longer that residents had lived in a residential area, the more likely they were to use the CCG frequently. The turning point is a year. Residents who had lived in this project for longer than a year were more likely to use the CCG than those less than a year. In the occupation subgroups, retired and un-employed residents used the outdoor environment more often than students and employed residents. Most of the childhood daily users of an outdoor environment will keep the habit of visiting the CCG on daily basis, while about 45% of the seldom users in childhood keep their habit as adults.

9.2An investigation of demographic and attitudinal variables discriminating use of the CCG at city level

9.2.1 Beijing

9.2.1.1 Demographic characteristics discriminating use of the CCG

1) Gender

Distribution of the frequency of use among the gender groups (Beijing)

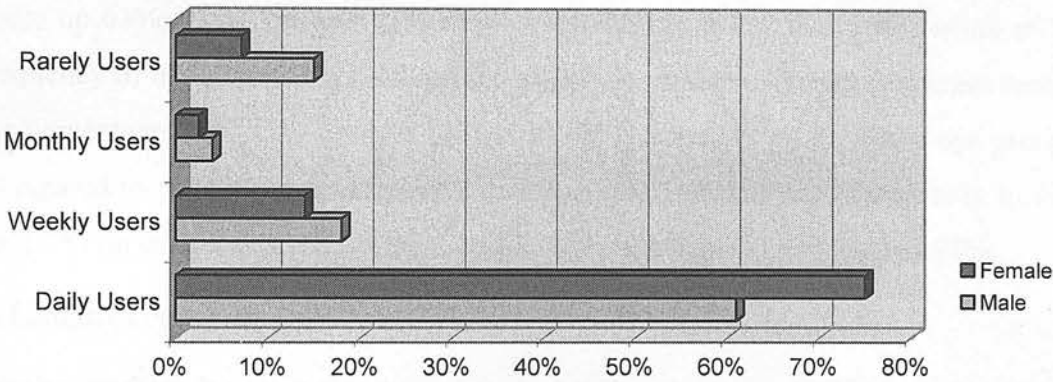


Chart 9-10

The difference between different gender groups reached significant levels (Chi-square=9.02, P-value=.031). For male residents, 60% visit the outdoor environment on a daily basis, 18% on a weekly basis, 3% on a monthly basis and 14% of male residents seldom visit the CCG. In female residents, 75% of them are daily users, 13% are weekly users, 2% are monthly users and 7% are rarely users (Chart 9-10).

Compared to male residents, the percentage of daily users is higher than for the males. The percentage of female weekly users, monthly users and rare users are all lower than male. Female residents are more likely to visit the CCG.

2) Age

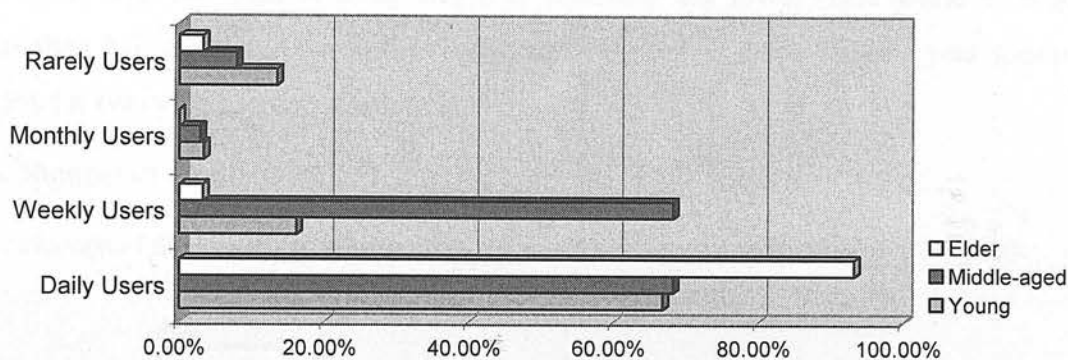


Chart 9-11

In young residents group, the percentage of daily, weekly, monthly and rarely users make up 63%, 17%, 3% and 12% respectively (Chart 9-11). The distribution of the frequency of use group in middle-aged residents is similar to young residents, except the percentage of weekly users at 67%. It is the highest one of the three age groups. Compared to young and middle-aged residents, elder people are more likely to visit the CCG on daily basis. The percentage for daily users in old residents is 92%.

3) Length of residence

Distribution of the frequency of use among the length of residence groups (Beijing)

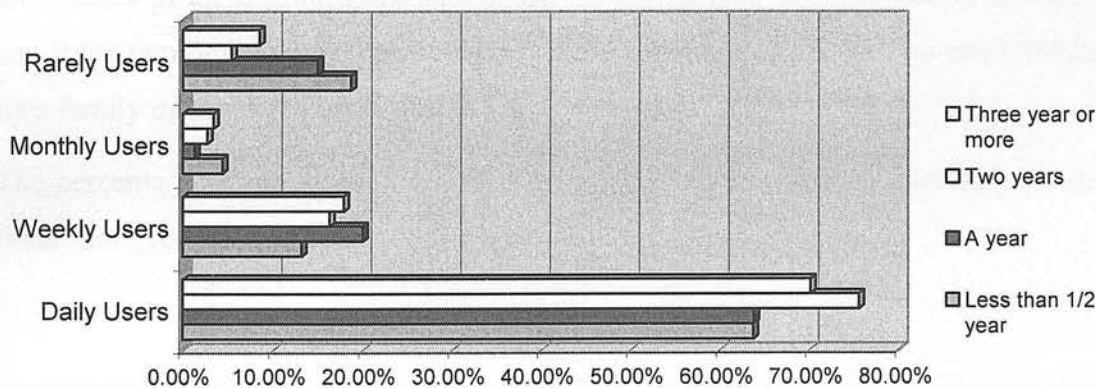


Chart 9-12

Among residents who have lived in their community for three years or more, the percentage of the daily users are 75.5% and 70.1% (Chart 9-12). These percentage are higher than the percentages of daily users in short length of residence groups (63.7% for less than half a year and 63.8% for a year). Compared to the residents

who have lived in their community a year or less, the percentage of rarely users in residents with two year or more length of residence are lower (18.7% and 15% for less than half a year group and a year group, respectively; 5% for two year group , 8.5% for two year or more group)

4) Number of family members

Distribution of the frequency of use among the number of family members groups (Beijing)

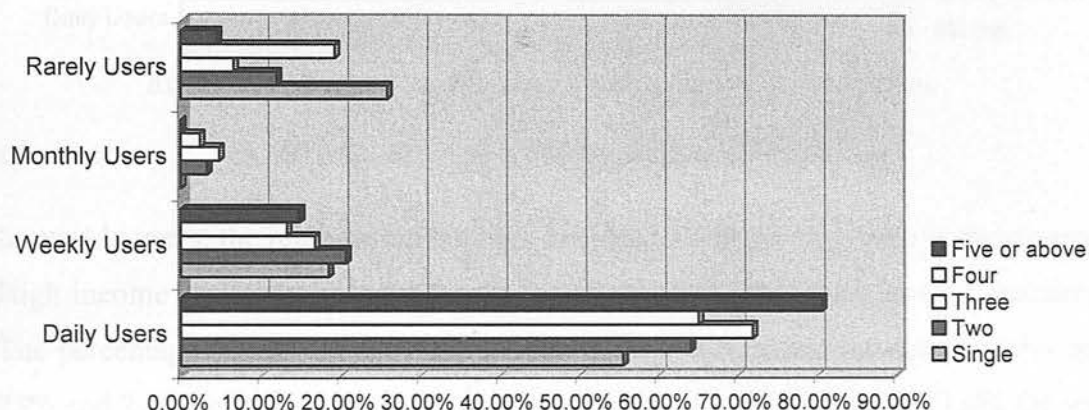


Chart 9-13

Residents who have three or five family members are more likely to visit the outdoor environment than those residents who are single or just married. The percentages for daily users in these groups are 80.6% and 71.9% for five or more family members and three family members, respectively, 55.6% for single, 64% for two and 65% for four family member groups (Chart 9-13).

The percentage of rare users in residents who are single is much higher than for the other four groups, at 25.9%.

5) Income

In response to the frequency of use of the outdoor environment, there is a clear difference between the residents who have middle-higher and high income levels and those who have middle-lower or low income levels (Chart 9-14). The percentage of daily users in the middle higher income group is 60.6%, and 60% for the high income group. Compared to the high income group, the percentage of daily users among the middle lower and low income groups are 72.7% and 72.1%, respectively.

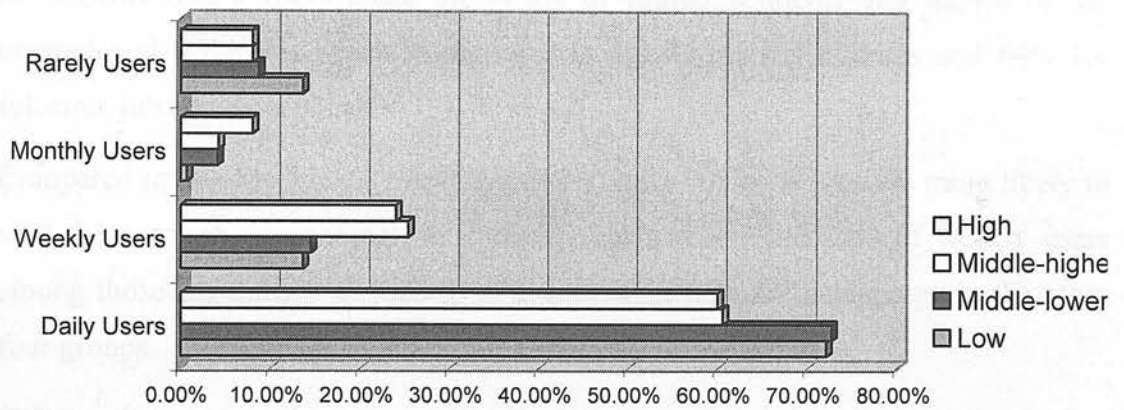


Chart 9-14

In weekly users, the relationship between high and low income groups is the reverse. High income residents are more likely to visit the CCG than low income residents. The percentage of the weekly users in high and middle-higher income residents are 25% and 24%, respectively. In low income respondents, the number is 13.6% for low income and 14.5% for middle lower income residents.

The other interesting point is that the percentage of rare users among the low income respondents is higher than for the other three income groups, at 13.6%.

6) Occupation

Distribution of the frequency of use among the occupation groups (Beijing)

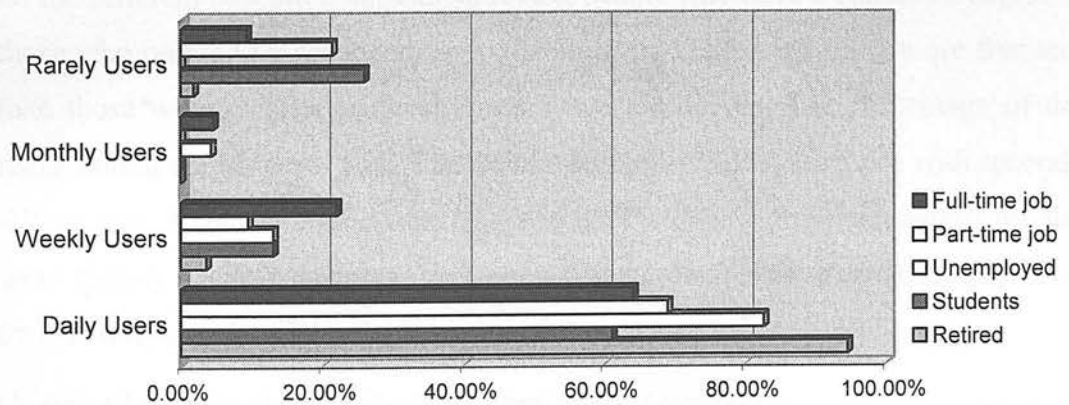


Chart 9-15

The difference between different gender groups reached significant levels (Chi-square=8.87, P-value=.044). Among the respondents, retired residents and

unemployed residents are more likely to visit the CCG than residents who have jobs or students. Daily users made up 94.5% of retired residents and 82.6% of the unemployed residents, which is higher than the 61.1% for students and 64% for full-time job residents (Chart 9-15).

Compared to other residents, respondents who have full-time jobs are more likely to visit the outdoor environment on a weekly basis. There are 22% of weekly users among those residents with jobs. It is much higher than the percentage in the other four groups.

7) Education

Distribution of the frequency of use among the education groups (Beijing)

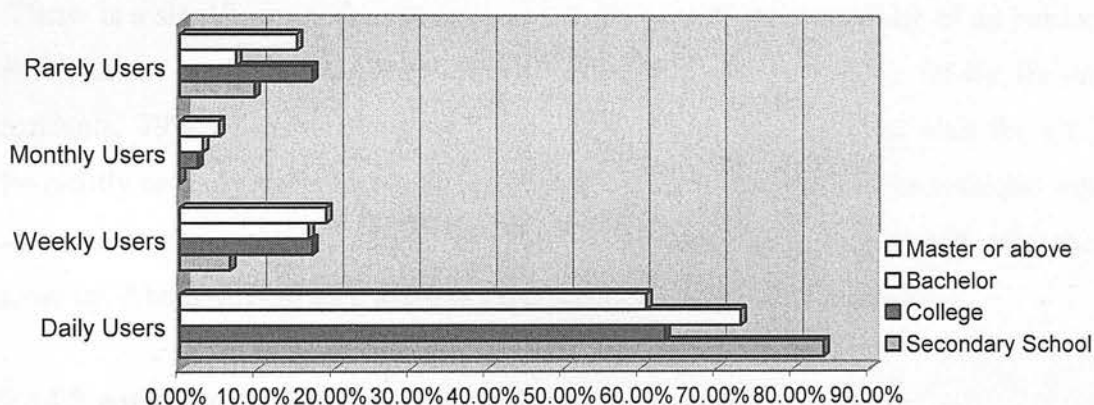


Chart 9-16

Of the different education attainment levels, people who have a bachelors degree and those who only had a secondary school education, visited the CCG more frequently than those with a college education or a masters degree. The percentage of daily users among the residents with a bachelors degree is 73.1%; for those with secondary school educational attainment levels, it is 83.9%. While the percentages for daily users among the respondents who have a college or masters degree are 63.2% and 60.8%, respectively (Chart 9-16).

Compared to the residents who have a college or university education, the percentage of weekly users is the lowest in the group, at 6.5%.

8) Frequency of use of an outdoor environment in childhood

Distribution of the frequency of use among different frequency of use of an outdoor environment in childhood groups (Beijing)

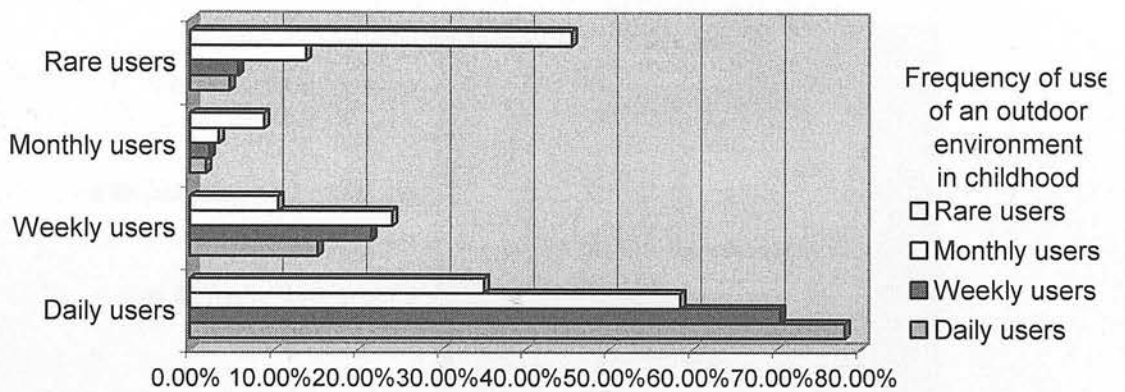


Chart 9-17

There is a significant difference among the different frequency of use of an outdoor environment in childhood groups (Chi-square=55.75, P-value=.000). Of the Beijing residents, 79% of respondents who were daily users in childhood visit the CCG frequently as daily users in adulthood (Chart 9-17). In contrast, those residents who were rare users in childhood are more likely to visit the CCG infrequently after they grew up. About 46% of rare users in childhood kept their habit as adults.

9.2.1.2 Attitudinal variables discriminating the use of the CCG

This section lists environmental variables which have significant differences between different frequency of use groups. Of these variables, seven come from the activity category, two from the bird's-eye view category, one from the natural element category and two from the facility category. Chart 9-18 shows the attitudinal levels in response to the environmental preference variables of the different frequency of use groups.

In the activity category, daily users showed a strong preference for the activities to "go for a walk" (Mean=1.42, Chi-square=8.17, P-value=.043), to "do some exercises" (Mean=1.37, Chi-square=9.25, P-value=.026), to "accompany children" (Mean=1.14, Chi-square=15.4, P-value=.001) and to "approach a natural environment" (Mean=1.43, Chi-square=10.01, P-value=.018).

Attitudinal levels of the different user groups in response to environmental preference variables (Beijing)

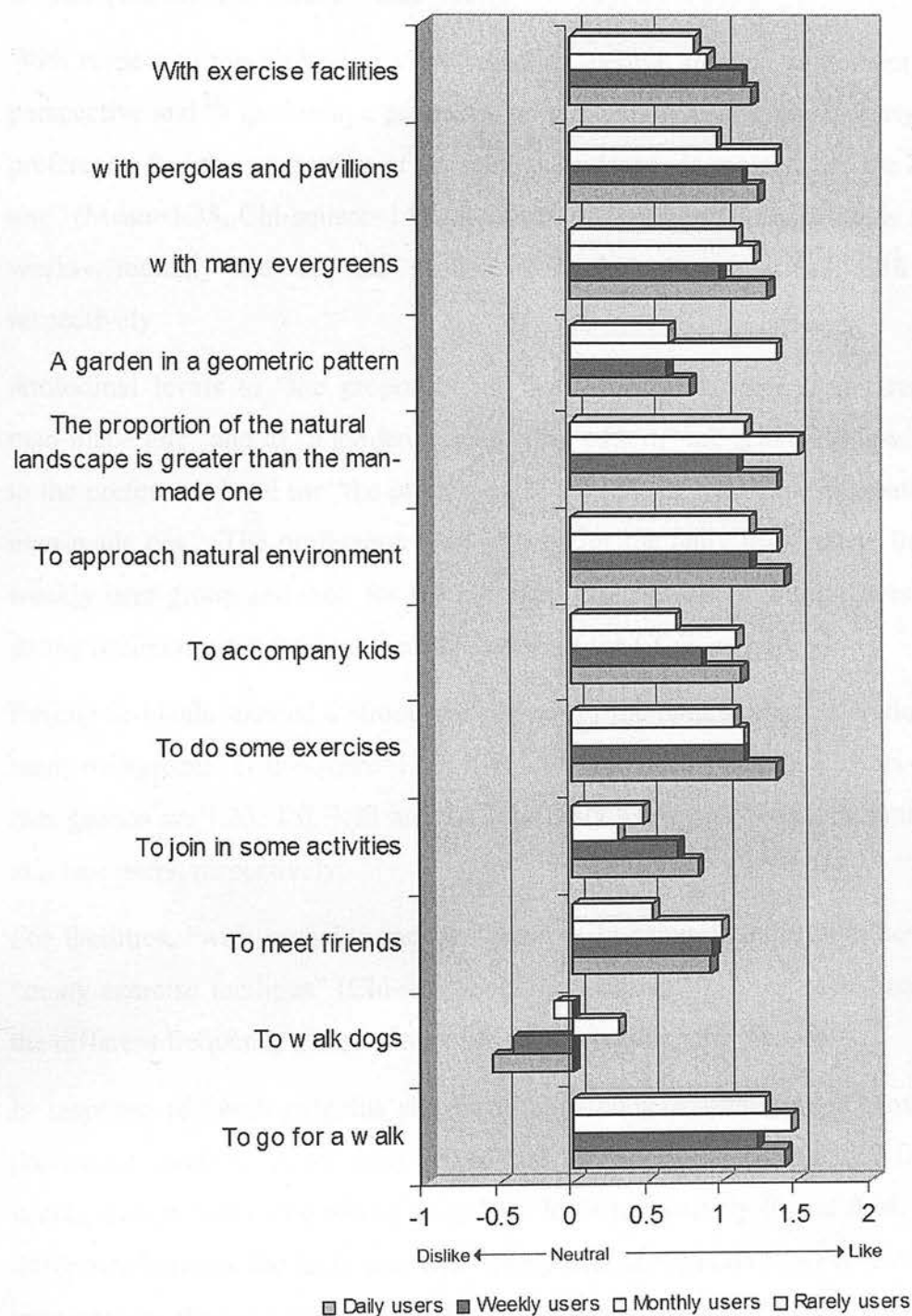


Chart 9-18

For the activities to “meet friends” and to “join in some activities”, daily users showed agreement levels at 0.92 (Chi-square=10.01, P-value=.018) and 0.84

(Chi-square=12.58, P-value=.006). Of these activities, Beijing residents disliked the activity to “walk dogs” in the CCG. The attitudinal level in response to this activity is -0.55 (Chi-square=9.26, P-value=.026).

With respect to the bird’s-eye view variables, people showed agreement about the perspective and “a garden in a geometric pattern”; daily user groups showed a strong preference for “the proportion of the natural landscape is greater than the man-made one” (Mean=1.38, Chi-square=14.4, P-value=.002). The attitudinal levels among the weekly, monthly and rare user groups were relatively low at 1.2, 1.38 and 1.19, respectively.

Attitudinal levels to “the proportion of the natural landscape is greater than the man-made one” and to “a garden in geometric pattern” are relatively low, compared to the preference level for “the proportion of the natural landscape is greater than the man-made one”. The preference level is 0.80 for the daily user group, 0.65 for the weekly user group and 0.66 for the rare user group; while monthly users showed a strong preference for the “geometric pattern” of the CCG, at 1.38.

Beijing residents showed a strong preference for the natural element variable -“with many evergreens” (Chi-square=13.9, P-value=.003). The attitudinal levels of the four user groups are 1.33, 1.0, 1.23 and 1.12 for daily users, weekly users, monthly users and rare users, respectively.

For facilities, “with pergolas and pavilions” (Chi-square=10.05, P-value=.018) and “many exercise facilities” (Chi-square=12.7, P-value=.005), the attitudinal levels of the different frequency of use groups showed significant differences.

In response to “with pergolas and pavilions”, all four user groups showed strong preference levels (1.26 for daily users, 1.15 for weekly users and 1.38 for monthly users), except rare users, whose attitudinal level is relatively low at 0.98. There is a difference between the daily user and weekly user groups and those monthly and rare user groups. People who visit the CCG frequently are more likely to show strong preference levels at 1.22 and 1.15, while the less frequent user groups showed relatively low preference level at 0.92 and 0.83, respectively.

9.2.1.3 Predictors of actual use in Beijing

According to the results of the H&L test, the null hypotheses of these three sections can be accepted. The accurate rate of the classification for the demographic section is 64.7%, for the activity section, it is 62.6%, for the physical attributes section, it is 62.7%, respectively. Appendices 9-6 to 9-8 show the results of the H&L tests for the demographic, activity and physical attributes sections in response to actual use.

In Beijing, the demographic variables gender (Wald=9.68, P-value=.002, Exp(B)=.49), occupation (Wald=13.1, P-value=.000, Exp(B)=.73) and the frequency of use of an outdoor environment in childhood (Wald=36.6, P-value=.000, Exp(B)=.523) have a significant influence on residents' frequency of use of the outdoor environment.

Male residents are more likely to visit the CCG than female residents. In different occupational groups, residents who have a job are less likely to visit the outdoor environment than unemployed or retired residents. Different to occupation, the relationship between frequency of use of the outdoor environment in childhood and in adulthood, varied directly.

With respect to the environmental preference section, "to walk dogs" (Wald=7.1, P-value=.008, Exp(B)=.77), "to join in some activities" (Wald=6.95, P-value=.008, Exp(B)=1.5) and "to approach natural environment" (Wald=4.67, P-value=.031, Exp(B)=1.53) are three predictors from the activity category.

The other two predictors come from the physical attributes category: there are "many evergreens" (Wald=16.2, P-value=.000, Exp(B)=2.15) and "exercise facilities" (Wald=14.0, P-value=.000, Exp(B)=2.19).

Of these predictors, all of them can improve residents' frequency of use, except the activity "to walk dogs". People strongly disagree with this activity. However, residents prefer "to join in some activities" and "to approach natural environment" in the CCG and thus they increase their frequency of outdoor environmental use. The influence of the physical attributes "many evergreens" and "exercise facilities" is also positive.

9.2.2 Hangzhou

9.2.2.1 Demographic characteristics discriminating use of the CCG

1) Gender

Distribution of the frequency of use among the gender groups (Hangzhou)

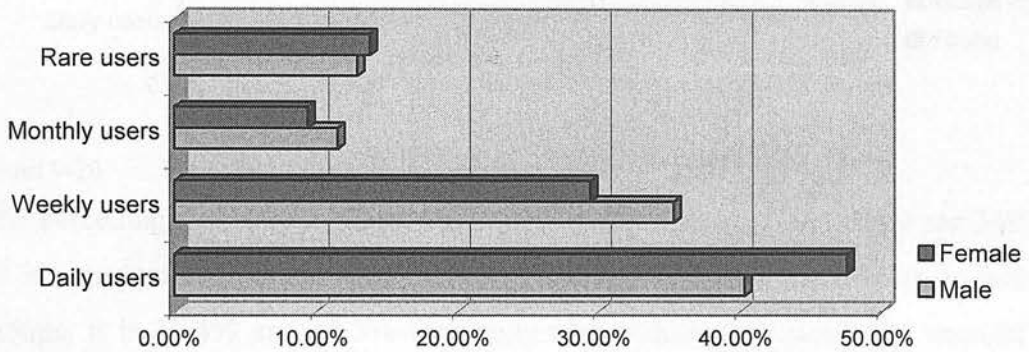


Chart 9-19

The distributions of the gender in different user groups are relatively even. There is no significant difference between user groups in response to the frequency of use of the outdoor environment. Of the different frequency of use groups, the percentage of female residents is higher than male residents among the daily and rare users.

The percentage of female to male was 47% to 40% for the daily users, and 13% to 12% for the rare users (Chart 9-19). While for the weekly and monthly user groups, the percentage of female residents was less than for the male: 35% of male respondents are weekly users and 11.5% are monthly users; while the figures for female weekly and monthly users are 30% and 9.4%, respectively.

2) Age

The difference between different gender groups reached significant levels (Chi-square=10.13, P-value=.029). Older residents showed differences from the young and middle-aged residents. Compared to other residents, older people are more likely to be daily users (73.3%) than young (38.9%) and middle-aged (43.3%) (Chart 9-20). However, this situation was reversed in the weekly, monthly and rare user groups.

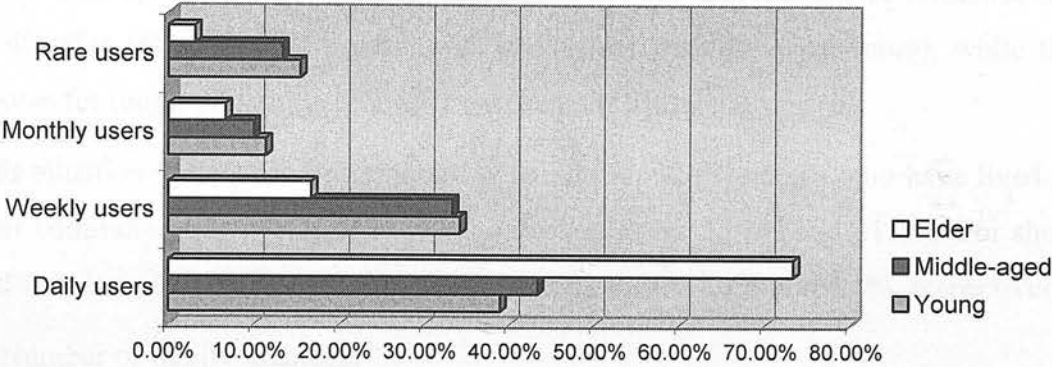


Chart 9-20

The percentages of weekly users for young and middle-aged residents are 34% and 33.3%, respectively, which are higher than the 16.7% for older residents. In rare user groups, it is 15.4% and 13.3% for young and middle-aged residents, respectively, which are much higher than the 3.1% in older residents.

3) Length of residence

Distribution of the frequency of use among the length of residence groups (Hangzhou)

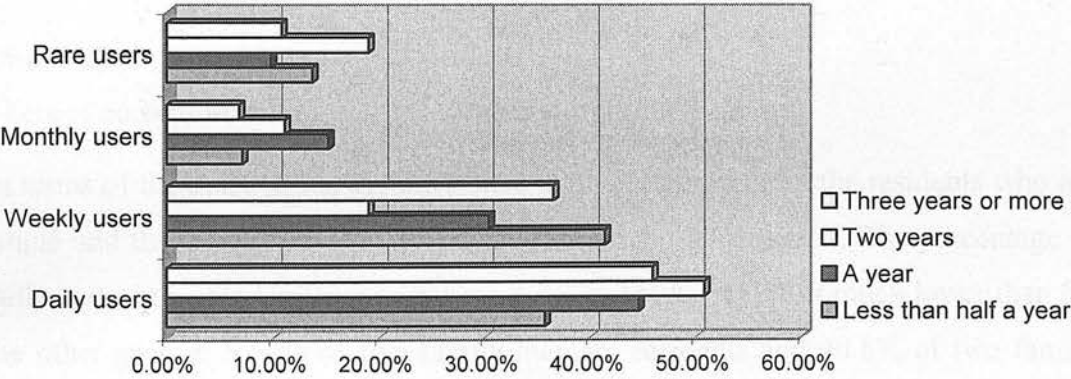


Chart 9-21

Although there is no significant difference among the different length of residence groups, the statistics also showed that people's frequency of use of the CCG varies, depending on the time they have lived in a particular place. In the daily user groups, the big difference was identified between those residents who have been in residence for less than half a year (35.7%) and those who have been there for a year or more (44.6% for a year long, 50.8% for two years long and 45.9% for those who have

While in the weekly user groups, the percentages for short length of residence are 41.4% (for less than half a year) and 36.5% (for three years or more), while the figures for those with a year (30%) or two years (19%).

This situation is reversed in the monthly user group. Of residents who have lived in their community for a year or two, the percentages are 15.2% and 11.1%. For short and very long length of residence groups, the number is 7.1% and 6.8%, respectively.

4) Number of family members

Distribution of the frequency of use among the number of family members groups (Hangzhou)

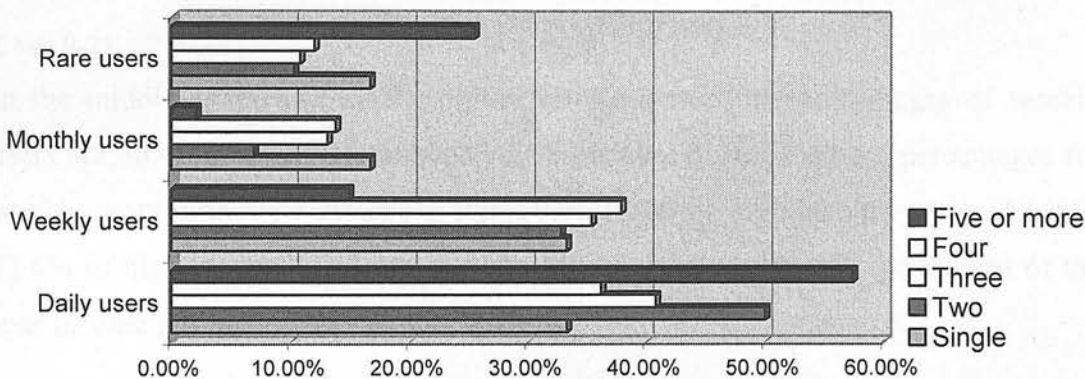


Chart 9-22

There is no significant differences identified from the K-W test.

In terms of the daily users, the difference is presented between the residents who are single and those who are married or have other family members. The percentage of daily users in single family member residents is 33.3%, which is much lower than for the other groups. 57.4% of five family member residents and 40.8% of two family member residents are daily users (Chart 9-22).

Compared to daily users, Hangzhou residents are more likely to be weekly users. The percentage of weekly users in single family member residents is 33.3%, in two-member families, it is 32.8%, in three-member families it is 35.4% and in four-member families it is 37.0%.

5) Income

In Hangzhou, 48.9% of low income residents, 44.4% of middle-higher and 41.9% of

high income residents are daily users. The percentage of daily users in middle-lower income group is relatively low at 39.4% (Chart 9-23).

Distribution of the frequency of use among the income groups (Hangzhou)

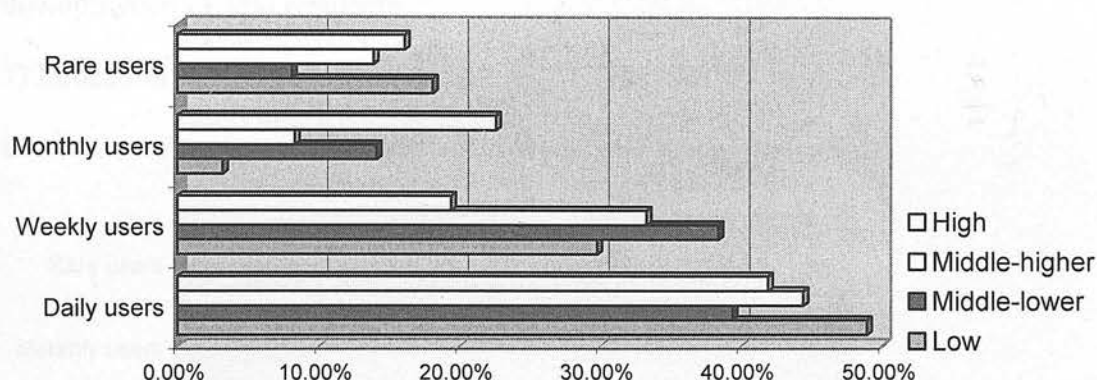


Chart 9-23

In the middle-lower and middle-higher income group, the percentages of weekly users are 38.4% and 33.3%, respectively, which are higher than the percentages for weekly users in the low income group (29.8%) and the high income group (19.4%). 22.6% of high income residents are monthly users. This figure is the highest of the four income groups.

6) Occupation

Distribution of the frequency of use among the occupation groups (Hangzhou)

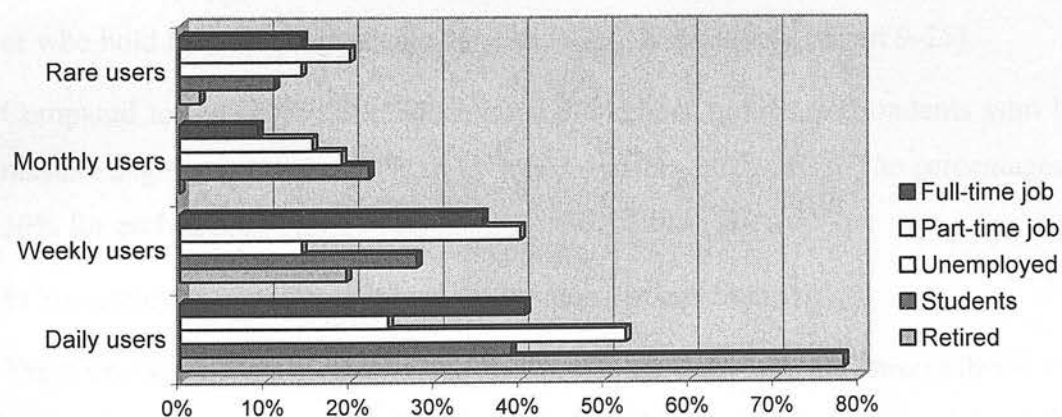


Chart 9-24

The difference between different gender groups reached significant levels (Chi-square=15.4, P-value=.010). In terms of the percentage of daily users in each occupational group, retired residents had the highest figure of the five occupational

The percentages for weekly users among residents in jobs were 35.6% (full-time job) and 40% (part-time job), which are higher figures than for retired (19.5%) and unemployed (14.3%) residents.

7) Education

Distribution of the frequency of use among the education groups (Hangzhou)

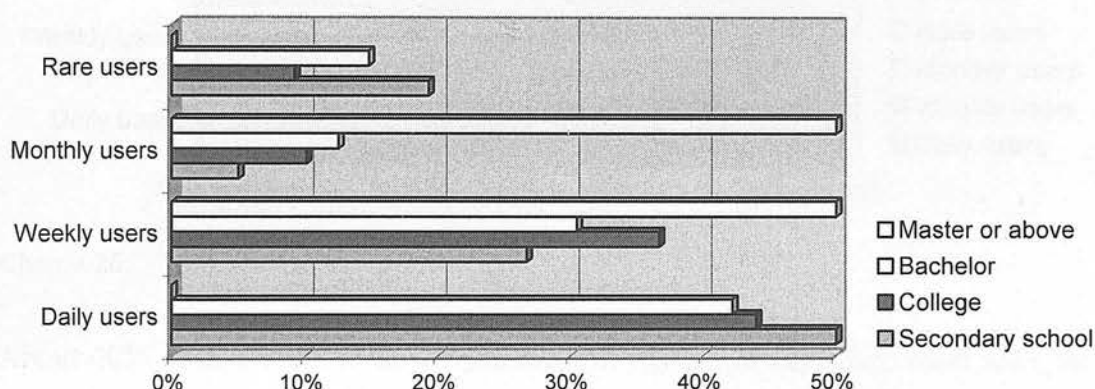


Chart 9-25

The distribution of daily users in the different educational attainment groups shows that low-educated respondents are more likely to visit the CCG than highly-educated residents. The percentage for daily users who had been educated to secondary school level was 50%. While the percentages for residents who have been college educated or who hold bachelor degrees are 44% and 42%, respectively (Chart 9-25).

Compared to the other three educational attainment groups, respondents who have masters degrees are more likely to be weekly and monthly users. The percentages are 50% for each group.

8) Frequency of use of an outdoor environment in childhood

There are significant differences between the frequency of use in childhood of an outdoor environment groups (Chi-square=43.6, P-value=.000). In Hangzhou, 55% of respondents who visited an outdoor environment on a daily basis in childhood kept their habit after they grew up. So too do childhood weekly users. 37% of childhood weekly users visit the CCG as adults on a weekly basis. This figure is higher than the percentage for childhood users who visit the CCG on a daily basis (30.2%), monthly

Distribution of the frequency of use among different frequency of use of an outdoor environment in childhood groups (Hangzhou)

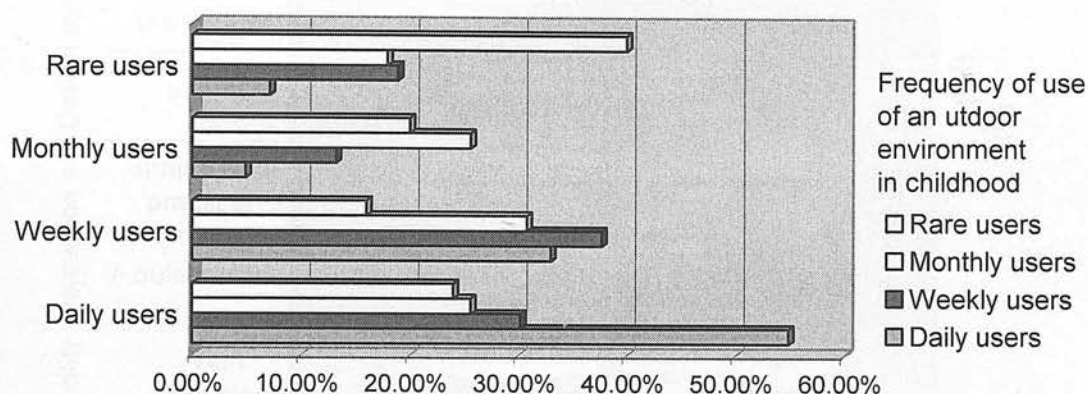


Chart 9-26

About 40% of rare users of an environment in childhood kept their habit after they grew up. Compared to other frequency of use groups, the distribution of childhood monthly users in the adult frequency of use groups is even. Among respondents who visited an outdoor environment in childhood on a monthly basis, 25% of them visit the CCG on a monthly basis as adults, 32% on a weekly basis, 25% on a daily basis and 18% on a rare basis.

9.2.2.2 Attitudinal variables discriminating the use of the CCG

There are eleven environmental preference variables which have significant differences between the different frequency of use groups. Of these variables, two items come from the activity category, one from the bird's-eye view category, two from the facility category and three from the perception and design style category.

In the activity category, people showed significant differences in terms of to "meet friends" (Chi-square=25.7, P-value=.000) and to "approach a natural environment" (Chi-square=13.4, P-value=.004).

Daily users showed a strong preference for both these activities, at 1.05 and 1.31, respectively. Compared to daily users, the attitudinal levels of less frequent users in response to those two activities were low, especially for monthly users (0.52 and

Distribution of the frequency of use among the education groups (Hangzhou)

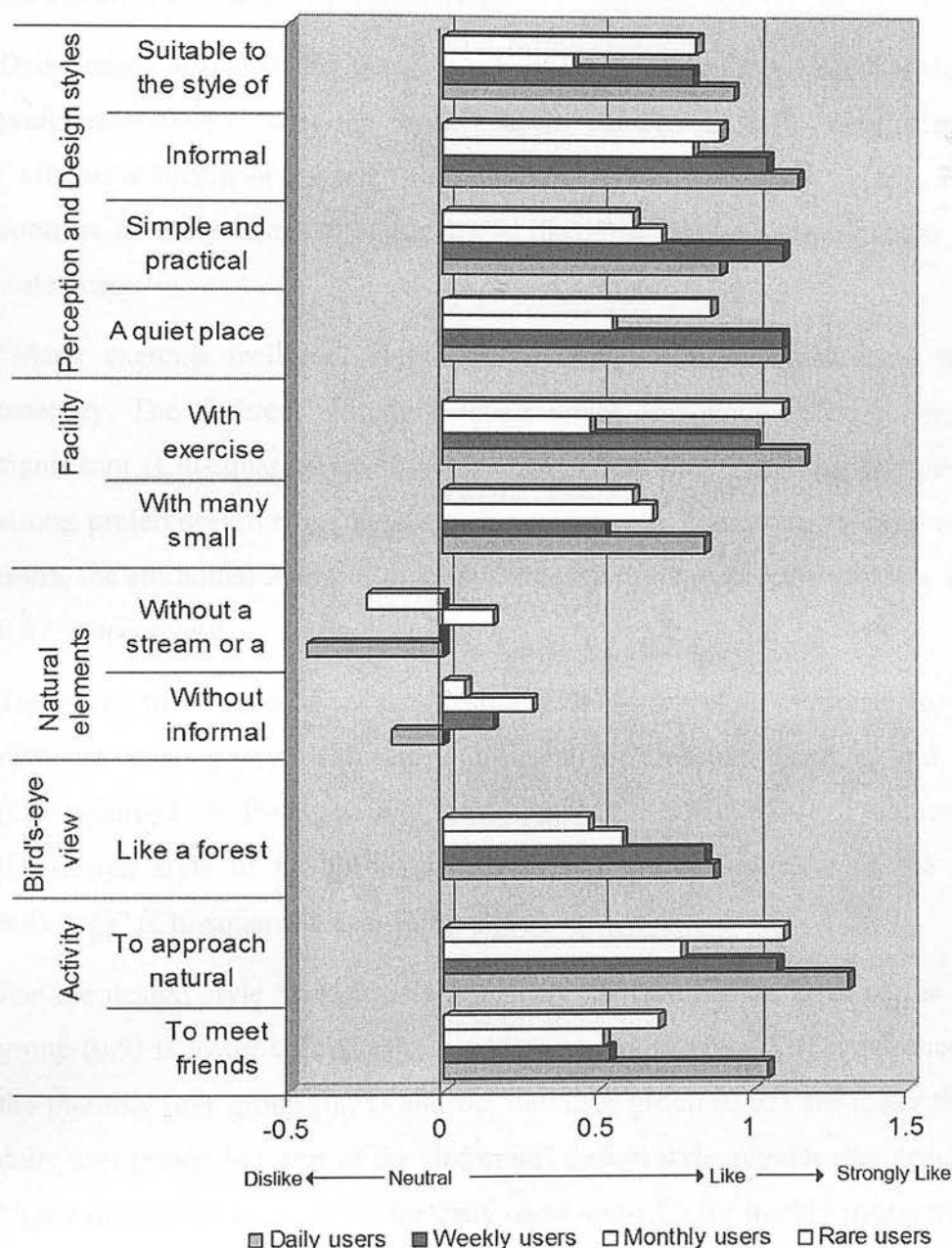


Chart 9-27

Hangzhou residents are sensitive to the natural elements of the CCG. The attitudes to “without natural landforms” (Chi-square=8.8, P-value=.032) and “without a stream or a pool” reached significant levels (Chi-square=11.76, P-value=.008). Of the two physical attributes, the difference mainly existed between the daily user group and the less frequent user groups.

The preference level of daily users in response to “without natural landforms” is -0.17, while the other three less frequent user groups showed a preference for this item at 0.16, 0.29 and 0.07, respectively.

Daily users also disliked the CCG “without a stream or a pool” (Mean of the preference=-0.44.) Although weekly users showed a slight disagreement about “without a stream or a pool”, the attitudinal level is close to neutral at -0.01. In contrast to daily users, monthly users liked the outdoor environment without a waterscape.

“Many exercise facilities” is the only variable which comes from the facility category. The different attitudinal levels which Hangzhou residents showed were significant (Chi-square=11.6, P-value=.009). Both daily, and weekly users showed strong preferences for this item at 1.1, respectively. Compared to daily and weekly users, the attitudinal levels of monthly, and rare users were relatively low at 0.55 and 0.87, respectively.

There are three perception and design style variables in response to which the different user groups showed significant differences -“simple and practical” (Chi-square=11.5, P-value=.009), “informal” (Chi-square=8.41, P-value=.038) and the design style of the CCG is “suitable to the design style of the residential buildings” (Chi-square=8.1, P-value=.044).

For the design style “simple and practical”, the preference level of the daily user group (0.9) is lower than for the weekly user group (1.1). The preference levels of the monthly user group (0.71) and the rare user group (0.62) are lower than for the daily user group. In terms of the “informal” design style, regular user groups showed higher preference levels (1.15 for daily users and 1.05 for weekly users) than the less frequent user groups (0.81 for monthly users and 0.9 for rare users).

The distribution of the preference levels for “suitable to the design style of the residential buildings” among the user groups is similar to “informal”. Although the attitudinal levels of daily users and weekly users are relatively low at 0.94 and 0.81.

9.2.2.3 Predictors of actual use in Hangzhou

Appendix 9-9 to 9-12 shows the results of the H & L tests for demographic, activity and physical attributes, perception and design style sections in response to actual use. According to the results of the H & L test, the null hypotheses of these four sections can be accepted. The accurate rate of classification for the demographic section is 64.6%, for the activity section it is 64%, for the physical attributes section, 63.9%, and for the perception and design style section, 56.4%, respectively.

In Hangzhou, the demographic variables age (Wald=5.6, P-value=.018, Exp(B)=1.7), occupation (Wald=11.0, P-value=.001, Exp(B)=0.71) and the frequency of use of an outdoor environment in childhood (Wald=28.6, P-value=.000, Exp(B)=0.4) have a significant influence on residents' frequency of use of the outdoor environment.

Of the different age groups, older people are more likely to visit the CCG than middle-aged and young residents. Similar to Beijing, Hangzhou residents who have jobs visit the CCG less frequently, compared to retired and unemployed residents.

In terms of frequency of use in childhood of an outdoor environment, the more frequently residents visited the outdoor environment in childhood, the more likely they were to visit the CCG as adults.

Seven predictors were teased out from the environmental preference section. They are: "to meet friends" (Wald=19.35, P-value=.000, Exp(B)=2.4) and "to take a shortcut" (Wald=4.19, P-value=.04, Exp(B)=.81), from the activity category; "without natural landforms" (Wald=4.41, P-value=.036, Exp(B)=.75) and "with many small squares" (Wald=7.57, P-value=.006, Exp(B)=1.5), from the physical attributes category. The other three predictors "quiet" (Wald=4.95, P-value=.026, Exp(B)=1.6), "simple and practical" (Wald=6.24, P-value=.012, Exp(B)=0.6) and "informal" (Wald=4.6, P-value=.032, Exp(B)=1.5) are from the perception and design style category.

People prefer to "meet friends" in the CCG and this activity can increase the frequency of use. In contrast, the activities "to meet friends", "to take a shortcut" have a negative influence on people's frequency of use.

In terms of the physical attributes predictors, the relationship between “without natural landforms” and frequency of use is correlated inversely. It suggests that the natural landforms can increase the frequency of use of the CCG. “With many small squares” has a positive influence on people’s actual use because it can allow different groups of residents to carry out different activities in those squares.

As the only city which has perception and design style predictors, Hangzhou residents prefer to see the CCG as an environment which is quiet and the design style of it should be informal. Both characteristics can improve the frequency of use of the outdoor environment in Hangzhou, while, people dislike a “simple and practical” design style for the CCG which results in them using the CCG less frequently.

9.2.3 Shenzhen

9.2.3.1 Demographic characteristics discriminating use of the CCG

1) Gender

Distribution of the frequency of use among the gender groups (Shenzhen)

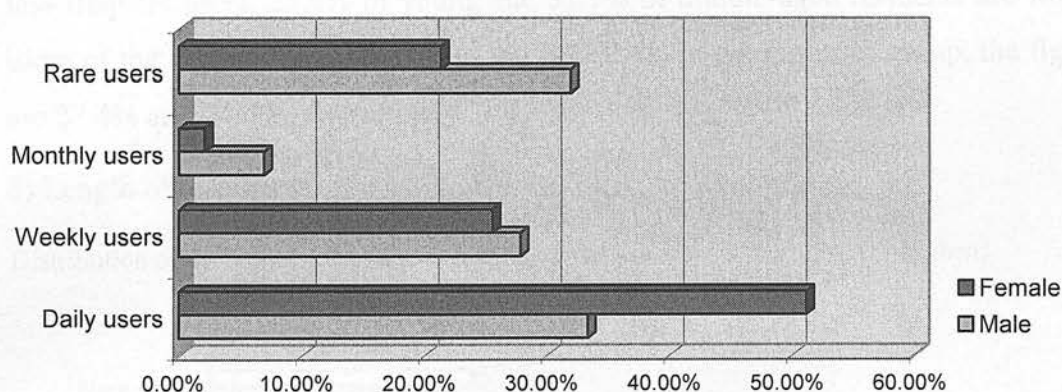


Chart 9-28

The difference between the two gender groups were significant (Chi-square=10.2, P-value=.041) in terms of frequency of use of the CCG. About 51.1% of female residents are daily users, while the percentage of male residents is 33.3% (Chart 9-28). Male residents are likely to be less frequent users (weekly, 27.8%; monthly users, 6.9%; and rare users, 31.9%) than female (25.5%, 2.1% and 21.3%, respectively).

2) Age

Distribution of the frequency of use among the age groups (Shenzhen)

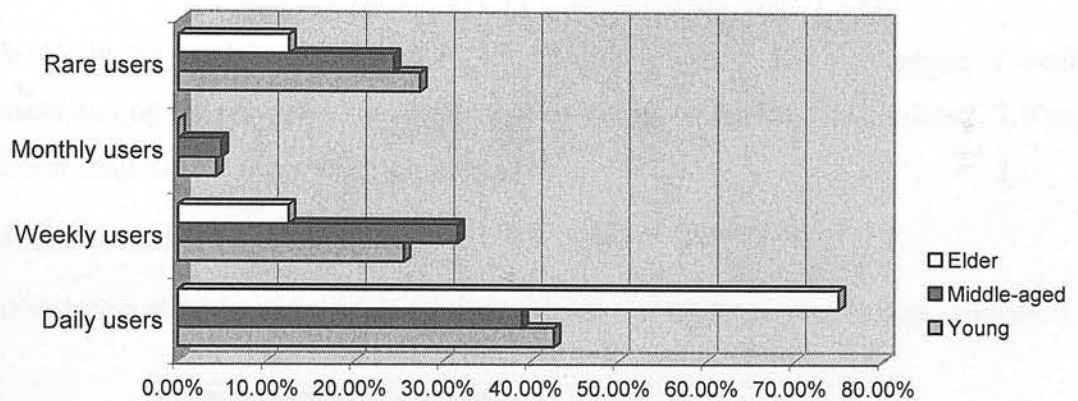


Chart 9-29

The distribution of Shenzhen residents in different user groups is similar to Beijing and Hangzhou. Most older people (75%) visit the CCG on a daily basis, followed by young (42.7%) and middle-aged residents (39%) (Chart 9-29).

Compared to older people, young and middle-aged residents are more likely to be less frequent users. 25.6% of young and 31.7% of middle-aged residents are weekly users of the outdoor environment of the HRFRA. In the rare user group, the figures are 27.4% and 24.4%, respectively.

3) Length of residence

Distribution of the frequency of use among the length of residence groups (Shenzhen)

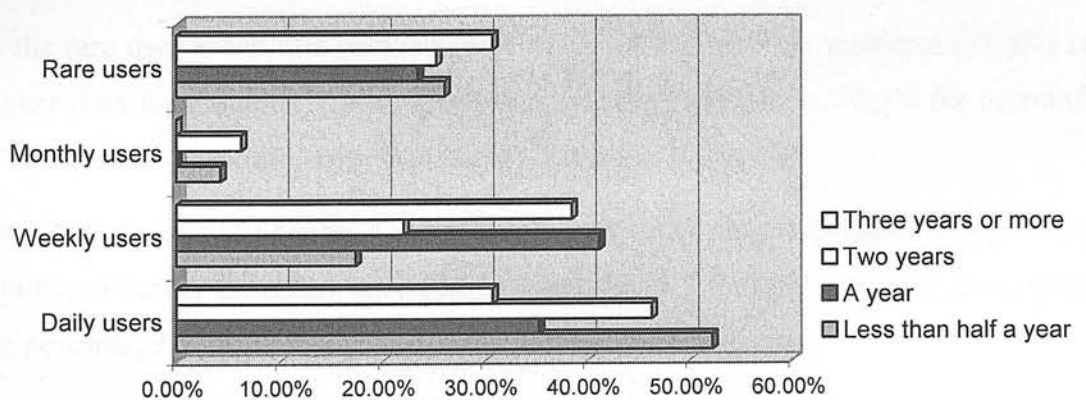


Chart 9-30

Of the four length of residence sub-groups, residents with less than half a year

Chapter 9: An Investigation of Demographic and Attitudinal Variables Discriminating Use of the CCG residency, 52.2%, visit the CCG on a daily basis. This is higher than the percentage of daily users among residents who have been in residence for a year or more (35.5% for one year, 26.3% for two years and 30.8% for three years or more) (Chart 9-30).

While in the weekly user group, the situation is reversed. The percentage of weekly users among the residents who have been in residence for less than a year (17.4%), is lower than for the other three groups.

4) Number of family members

Distribution of the frequency of use among the number of family members groups (Shenzhen)

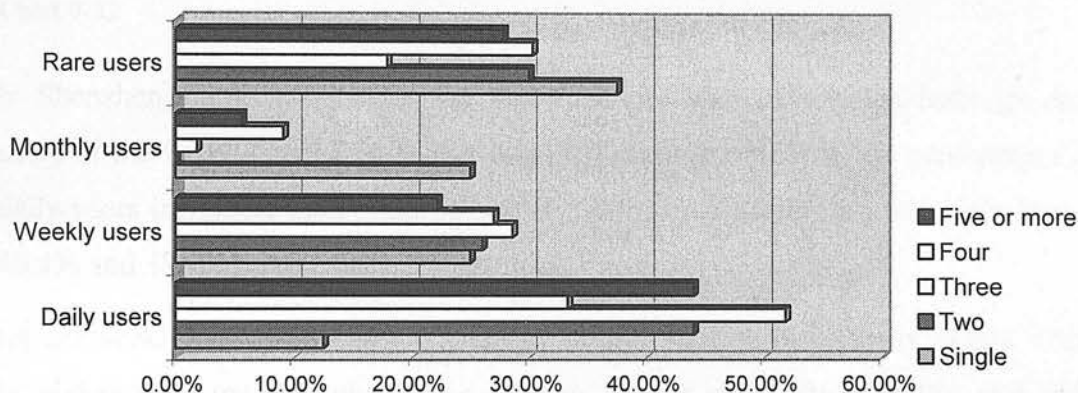


Chart 9-31

Of the Shenzhen residents, people who have two or more family members are more likely to visit the CCG on a daily basis. The percentages are 44% for two, 51.8% for three, 33.3% for four and 44% for five or more family members, while the percentage of daily users among single residents is quite low, at 12.5% (Chart 9-31).

In the rare user group, the percentage of single family member residents (37.5%) is higher than for the other groups (30% for two, 17.9% for three, 30.3% for four and 27.8% for five or more family members).

The characteristic of Shenzhen is that the percentage of daily users, depending on the number of family members, is relatively lower than for Beijing and Hangzhou, while the percentage of rare users is higher than for the other two cities.

5) Income

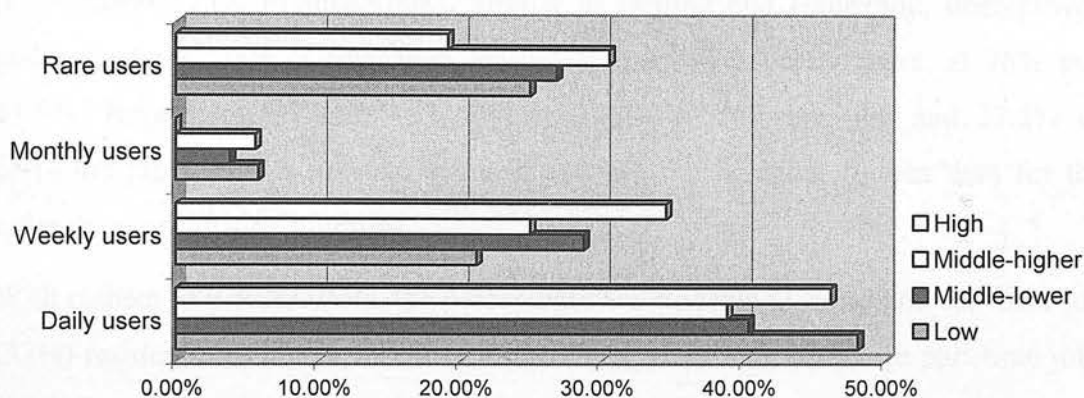


Chart 9-32

In Shenzhen, 48.8% of low income and 46.2% of high income residents are daily users of the CCG. Compared to low and high income residents, the percentages for daily users in middle-lower and middle-higher income groups are relatively low, at 40.4% and 38.9%, respectively (Chart 9-32).

Of the weekly user groups, the percentage of high income residents is 34.6%, which is higher than for the other three income groups at 21.2% , 28.8% and 25%, respectively (low, middle-lower and middle higher). While in the weekly user group, the percentage of high income residents (34.6%) is higher than for the other three income groups (21.2% for low, 28.8% for middle-lower and 27% for middle-higher).

6) Occupation

Distribution of the frequency of use among the occupation groups (Shenzhen)

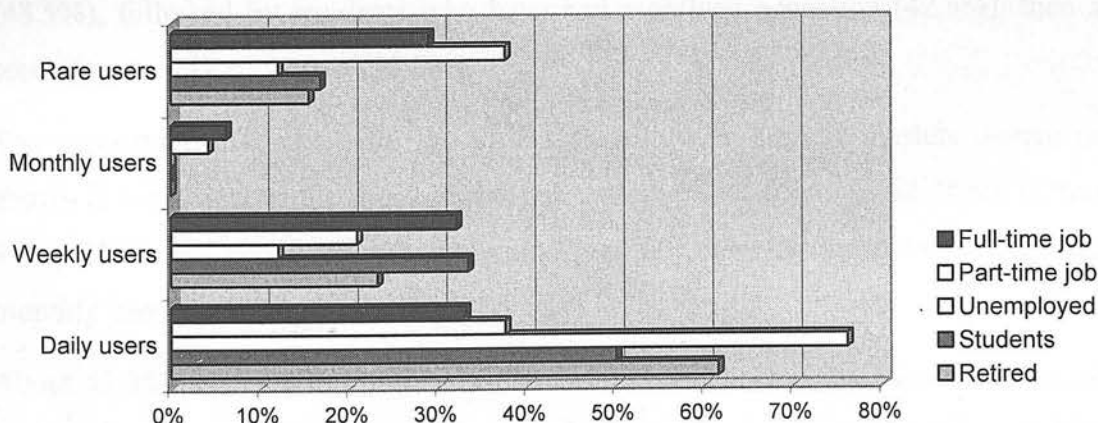


Chart 9-33

The difference between different gender groups reached significant levels (Chi-square=14.12, P-value=.008). Similar to Beijing and Hangzhou, unemployed and retired residents of Shenzhen are more likely to be daily users, at 76% and 61.5%, respectively (Chart 9-33). While 28.9% of full-time job and 37.5% of part-time job residents are rare users, which are much higher figures than for the other three occupational groups.

With respect to weekly users, the percentages for students (33.3%) and full-time job (32%) residents are higher than for the unemployed (12%), people in part-time jobs (20.8%) and retired residents (23.1%).

7) Education

Distribution of the frequency of use among the education groups (Shenzhen)

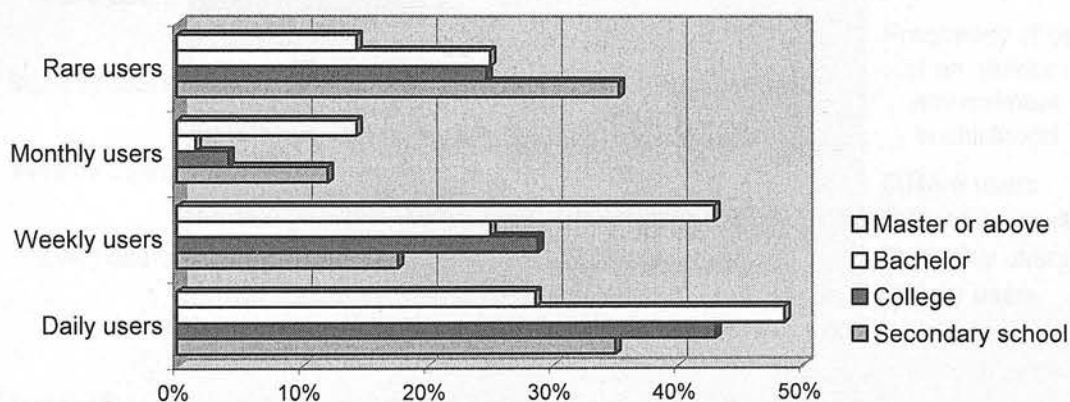


Chart 9-34

Shenzhen residents who have a bachelor degree are more likely to be daily users. (48.5%), followed by residents who have had a college education (42.5%), then a secondary school education (35.5%).

The percentage of daily users among respondents who have a masters degree or above, is the lowest of the four educational attainment level groups, at 28.6% (Chart 9-34). However, people with a masters degree are more likely to be weekly and monthly users.

About 42.9% and 14.3% of master degree holders in Shenzhen residents are weekly and monthly users, respectively. In terms of weekly users, 17.6% of secondary school, 28.8% of college and 25% of bachelor degree holders belong to this group.

The figure for the rare user group is similar to the daily user group. The percentage of rare users among highly-educated residents (masters degree holders or above) is the lowest one, at 14.3%, followed by bachelor degree (25%) and college degree holder (24.7%).

What is interesting is that low-educated residents who have only got secondary school education are more likely to be rare users at 35.4%, compared to the other three groups.

8) Frequency of use of an outdoor environment in childhood

Distribution of the frequency of use among different frequency of use of an outdoor environment in childhood groups (Shenzhen)

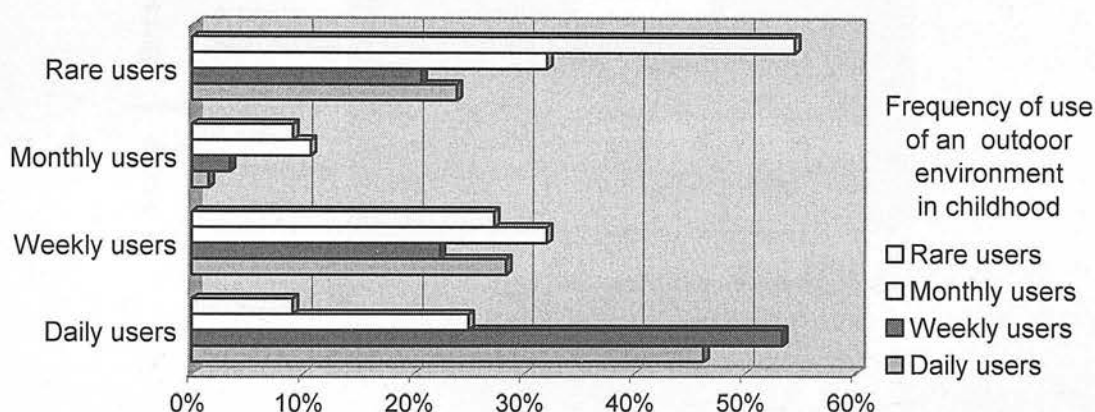


Chart 9-35

There is a significant difference between different frequency of use in childhood of an outdoor environment groups (Chi-square=8.43, P-value=.050). Among Shenzhen residents, 45% of childhood daily users and 53% of childhood weekly users visit the CCG on a daily basis as adults. Compared to the frequent users, the infrequent users in childhood are more likely to be infrequent users as adults. The percentage of childhood monthly users and rare users who become rare users as adults are 33% and 54%, respectively.

9.2.3.2 Attitudinal variables discriminating the use of the CCG

There are only four environmental variables to which different frequency of use groups showed significant difference. They are activity variable "to accompany

Chapter 9: An Investigation of Demographic and Attitudinal Variables Discriminating Use of the CCG children” (Chi-square=10.3, P-value=0.016), two bird’s-eye view variable “a big lawn with some tall trees” (Chi-square=12.24, P-value=0.007) and “likes a forest” (Chi-square=8.89, P-value=0.048), and “a big children’s playground with some facilities” (Chi-square=7.98, P-value=0.050).

Distribution of the frequency of use among the education groups (Shenzhen)

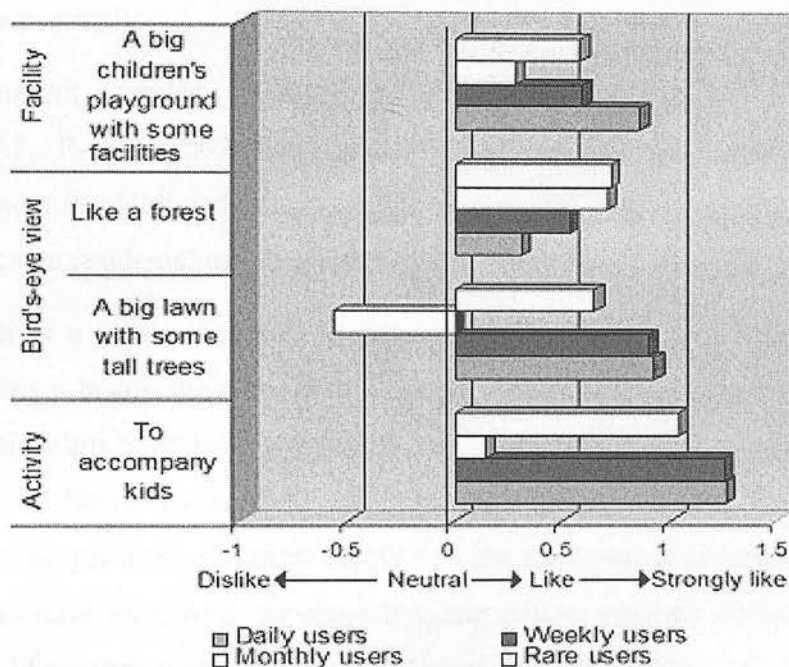


Chart 9-36

In response to the activity “to accompany children”, daily users and weekly users showed strong preference at 1.26 and 1.25. The third one is rare users whose attitudinal level is 1.04 followed by monthly users at 0.14 (Chart 9-36).

Daily users and weekly users showed higher preference level (0.93 and 0.90) than monthly users and rare users (-0.57 and 0.65), in terms of “a big lawn with some tall trees”. On the contrary, the attitudinal levels of monthly users and rare users to “like a forest” (0.71 and 0.72) are higher than daily users (0.31) and weekly users (0.54).

Of the four user groups, daily users show preference level at 0.86 to facility a big children’s playground with some facilities”.

9.2.3.3 Predictors of actual use in Shenzhen

Appendix 9-13 to 9-14 show the results of H&L tests for demographic and physical attribute sections in response to actual use. According to the results of the H&L test, the null hypotheses of these two sections can be accepted. The accurate rate of the classification for demographic section is 64.4%, for physical attribute section is 60.2% respectively.

In Shenzhen, gender (Wald=6.17, P-value=.013, Exp(B)=0.42), occupation (Wald=7.3, P-value=.007, Exp(B)=0.68) and the use frequency of an outdoor environment in childhood (Wald=7.37, P-value=.007, Exp(B)=0.57) have significant influences on residents' use frequency of the outdoor environment.

Shenzhen is a young city full of energy which shares some characteristics with Beijing. As a result, the demographic predictors of actual use are same as Beijing. The relationship have been showed in the regression analyses indicate that female residents in Shenzhen are less likely to visit the CCG than male. Retired and un-employed residents are more likely to visit the outdoor environment more than those who have jobs. And, the more frequent people visit the outdoor environment, the more likely they visit the CCG as frequent users as adults.

The other three predictors come from physical attribute section, which include "a big lawn with some trees" (Wald=4.61, P-value=.032, Exp(B)=1.54), "looks like a forest" (Wald=8.34, P-value=.004, Exp(B)=0.59) and "a big children's playground with some facilities" (Wald=3.85, P-value=.05, Exp(B)=1.43).

Of these three predictors, both the bird's-eye view variable "a big lawn with some trees" and facility variable "a big children's playground with some facilities" can improve Shenzhen residents' frequency of use. However, the perspective "looks like a forest" suggested the inverse relationship between this item and actual use. the frequency of use of the CCG decreases with the increase of the preference level for the bird's-eye view item-"looks like a forest".

Summary:

1. Demographic characteristics of frequency of use of the CCGs for all three cities

1) Gender: Across the three cities, female residents are more likely to be daily users than male residents. Compared to female, the percentages of male residents who visit the CCG on weekly and monthly basis are higher than female. However, there are two points which are different between cities. The first is the proportion of weekly users of Beijing is lower than Hangzhou and Shenzhen in general. The other one is that many Shenzhen residents are rare users (more than 30% in each gender group). In Beijing and Hangzhou, the percentages are about 7% and 12%, respectively.

2) Age: The similarity of the three cities is that old people visit the outdoor environment more frequently than young and middle-aged residents. The first different is about the weekly users of the three cities. The percentage of middle-aged residents who visit the CCG on a weekly basis in Beijing (67%) is much higher than in Shenzhen (31.7%) and Hangzhou (33.7%). Although the percentage of weekly users in middle-aged group is higher than the one in old in Beijing and Shenzhen, this percentage of weekly users in middle-aged group is lower than old in Hangzhou. The second one is the average percentage of rare users in Shenzhen is higher than Hangzhou, followed by Beijing.

3) Length of residence: The longer the residents live in their community, the more frequently that they visit the CCG. Although most of people like to visit the CCG on daily basis, the percentages of the daily users in different length of residence groups are different. In Shenzhen, residents who have live in their community less than half a year are more likely to visit the CCG (52.2%) than those who have lived there a year or more, while the percentages of daily users in less than half a year length of residence group in Beijing and Hangzhou are lower than those who have lived there a year or more.

4) Number of family members: The percentage of daily users in residents who are single is lower than other residents who have two or more family members, across the three cities. On the other hand, people who have five family members are more likely to be daily users of the CCG than other groups in Beijing and Hangzhou. However, it is different in Shenzhen.

The percentage of daily users in residents who have three family members is 52%, which is the highest one among the different number of family member groups. In

Hangzhou, the percentage of rare users in respondents who have five family members is the highest one (25%) among the different number of family member groups, while in Beijing and Shenzhen, the highest ones are in those residents who are single.

5) Income:

Beijing residents who have low or middle-lower income are more likely to visit the CCG on daily basis (about 70%). While the percentages of weekly users in middle-higher (24.5%) and high (23%) income group are higher than those in low and middle-lower income groups (about 12%). Compared to Beijing, the percentage of daily users in Hangzhou residents is relatively low (48.9% for low income residents, which is the highest one of the four income groups).

The percentages of the weekly users are high, especially middle-lower and middle-higher income residents (38.4% and 33.3%). Residents of Shenzhen showed some differences among the frequency of use. 48.1% low and 46% high income residents are daily users. Among the other two income groups, the percentages of the daily users are less than 40%.

6) Occupation:

In Beijing, 95% retired residents and 82% of unemployed residents are daily users. The percentage of daily users with jobs is more than 63%. The percentages of the daily users (both retired and full-time or part-time job) in Beijing residents are higher than Hangzhou and Shenzhen. Compared to Beijing, the percentages of weekly users among residents with jobs are high (more than 30%). Shenzhen is the city which has highest percentage of rare users in full-time and part-time job residents (28.9% and 35.3%).

7) Education:

In Beijing and Hangzhou, the low-educated residents visit the CCG frequently on a daily basis. The percentages of daily users in both cities (83% in Beijing and 50% in Hangzhou) are higher than those in high-educated. By contrast to Beijing and Hangzhou, residents in Shenzhen who have college and bachelor degrees are more likely to be daily users (42.5% and 48.5%) than those with high and those low

Chapter 9: An Investigation of Demographic and Attitudinal Variables Discriminating Use of the CCG educational attainment levels. In Shenzhen, highly-educated residents are more likely to be weekly users than poorly educated residents. So too for Hangzhou residents.

8) Frequency of use of an outdoor environment in childhood

All three cities show that people who visited an outdoor environment frequently as children are more likely to visit the CCG frequently as adults, especially in Beijing and Shenzhen. In terms of the percentages which childhood users kept their habit after they grew up, Hangzhou is different to Beijing and Shenzhen.

In Hangzhou, the percentage of weekly users in childhood who visit the CCG on a weekly basis in adulthood is higher than the other two cities. So do those monthly users and rarely users in Hangzhou.

2. Characteristics of the predictor of actual use in the three cities

In the demographic section, for occupation and childhood outdoor environmental use frequency, there are two significant predictors of actual use for all three cities. Gender is not a significant influence on people's frequency of use in Hangzhou but it is in Beijing and Shenzhen. In Hangzhou, it is age which has a significant influence on people's actual use.

In the physical attribute section, the predictors for Beijing and Hangzhou showed more similarities than Shenzhen which paid more attention to the outlook and facilities of the CCG. In Beijing and Hangzhou, natural elements and facilities were the focus of the residents. The bird's-eye view of the outdoor environment did not have a significant effect on people's actual use in these two cities.

However, the difference between Beijing and Hangzhou was in the content of the natural elements. "Many evergreens" was the significant predictor for residents' daily use in Beijing, while Hangzhou's residents thought that "natural landforms" was important. This difference might be as a result of difference in the climate. The average temperature of Beijing is lower than Shenzhen's.

The greenery of Beijing turns to grey and brown when the deciduous trees lose their leaves. Residents want to see green colours in this monotonous colour environment. In contrast, the plant resources of Hangzhou are plentiful because of its location and livable climate, therefore, Hangzhou's residents have more needs of natural

In Shenzhen, a city along the south coastline of China, plants grow fast, with plenty of rainfall and a warm temperature. Somehow, the fast-growing speed and the quantity of lush plants are problematic for its residents. “Forest” had a negative meaning for the people of Shenzhen, rather than it having a meaning of mystery or it being an interesting perception, which is how it was viewed by people in the northern cities, of Beijing and Hangzhou. Thus, the bird’s-eye view-“like a forest” had a negative influence on Shenzhen’s frequent users.

Hangzhou was the only city which had significant predictors from the perception and design style section.

Table 8-1 lists the significant predictors of each city. Table 8-2 lists the comparison of each city’s predictors and the possible reasons for these differences. Appendices 8-6 to 8-14 show the classification table and Chi-square test results of these analyses.

Table 9-1: Differences reflected in the predictors of actual use

Beijing				Hangzhou				Shenzhen			
	Wald	P-value	Exp(b)		Wald	P-value	Exp(b)		Wald	P-value	Exp(b)
Gender	9.68	.002	.49	Age	5.6	.018	1.7	Gender	6.17	.013	.42
Occupation	13.1	.000	.73	Occupation	11.0	.001	.71	Occupation	7.3	.007	.68
COEUF	36.6	.000	.523	COEUF	28.6	.000	.40	COEUF	7.37	.007	.57
To walk dogs	7.10	.008	.77	To meet friends	19.35	.000	2.4				
To join in some activities	6.95	.008	1.5	To take a shortcut	4.19	.040	.81				
To approach a natural environment	4.67	.031	1.53								
A place with many evergreens	16.2	.000	2.15	Without natural landforms	4.41	.036	.75	A big lawn with some trees	4.61	.032	1.54
With exercise facilities	14.0	.000	2.19	With many small squares	7.57	.006	1.5	Like a forest	8.34	.004	.59
								A big children's playground with many facilities	3.85	.05	1.43
				A quiet place	4.95	.026	1.5				
				Simple and practical	6.24	.012	.60				
				Informal design style	4.6	.032	1.5				

Table 9-2: Comparison of the Predictors of the Three Cities

Section		Cities	Differences	Possible Reasons
Demographics		All cities	Occupation & Childhood Outdoor Environmental Use Frequency are significant predictors of OEUF	
		Hangzhou	Age is the predictor of OEUF (Hangzhou is the oldest city of the three)	
	Activity	Beijing & Hangzhou	Social interaction is an important aspect of residents' daily life (to meet friends and to join in some activities)	Typical northern cities with good relationship between neighbours
		Shenzhen	Bird's-eye view and children's playground in Shenzhen	Resulting from age. Most residents are young people in their children-bearing years
Physical Attributes	Different Focuses	Beijing & Hangzhou	Natural elements and facilities	Correlating to life habit and frequency of use
		Beijing	Evergreens	Climate
	Different Contents	Hangzhou	Natural landforms	Hangzhou has a greater requirement for landscape than the other cities.
Perception and Design Style	Hangzhou is the only city predictors in this section	Natural, simple and practical design style, quiet perception	High quality of life and good attitudes	Hangzhou is the only city's predictors in this section

9.3 Univariate analyses of the predictors of actual use

There were some differences between the demographic variables in response to the significant predictors of actual use. A study of these differences, it might give a further explanation for the results of the logistic regression. Because the relationships between the demographic variables and environmental preference variables have been analysed in chapter seven, this part does not show the exact value of the K-W test but the list of the significant relationships between these variables and demographic variables.

From the number of the significant correlations with exist between the environmental preference items and some particular demographic variables, the author of this thesis intend to get a general description of the significant demographic characteristics which might distinguish the three cities from each other.

9.3.1 Univariate analysis of the significant predictors at the general level (the three cities together)

Table 9-3: List of Univariate Analysis Results in Response to the Significant Predictors of Actual use

Predictors of Actual use \ Demographics variables	Gender	Age	Length of Residence	Number of Family Members	Occupation	Education	Income	Childhood Outdoor Environmental Use Frequency
Meet friends	V	V		V	V			V
Walk dogs			V	V		V		
Go for a walk		V			V	V		
Approach a natural environment	V				V	V		
Without a stream or a pool	V	V			V	V		
Without natural landforms				V	V	V		
A lawn with tall trees						V		
Grand	V		V			V		V
Simple and Practical	V	V	V		V	V		
Suitable to the architectural style of the residential buildings	V					V		

Note: “V” means the K-W test was significant

Table 9-3 lists the results of the univariate analysis (K-W test results and

In terms of the number of predictors for which there are significant differences between the demographic groups:

Firstly, education was the most sensitive demographic variable in terms of almost all predictors of actual use. Although education was not a significant predictor of actual use, the K-W test showed that it was an important demographic variable which affected almost all the predictors of actual use, except the activity “to meet friends”.

Secondly, occupation was the second variable which had significant differences between the subgroups in response to the physical attribute and activity predictors, and showed more influences on the physical attributes and activities section than the perception and design style section. There were significant differences between the occupational subgroups in five predictors out of seven.

Thirdly, of the perception and design style predictors, the preference levels between the gender and education groups were differentiated significantly. Compared to gender and education, length of residence was the second most important variable for this section. There were significant differences between the length of residence subgroups in response to two out of three predictors in the perception and design style section.

In terms of the content of the predictors for which demographic variables showed significant differences:

Firstly, the number of family members had more influence on people’s attitudes to social interaction such as “to meet friends” than other activities such as “to go for a walk” and “to approach a natural environment”. The turning point was whether the respondent was single or not. Those who were married showed a greater preference level for public activity than single family member respondents.

The other difference was that highly educated residents (bachelor or masters degree holders) were more likely to take part in some personal activity (approach a natural environment, go for walks) than social activities (meet friends and join some activities) if they visited the CCG. This was true for the retired residents also.

Secondly, in the physical attributes and perception and design style section, residents

with bachelor and masters degrees showed a greater preference for waterscape, natural landforms and the simple design style of the CCG with an outlook, “a big lawn with tall trees” than the other groups whose educational levels were relatively low. What is interesting is that residents with bachelor degrees showed a preference for a “grand” design style while other groups showed a dislike of this item. There is no reasonable answer to explain this difference.

Occupation was another demographic variable which had a significant influence on people’s attitudes to natural elements. The difference mainly existed between unemployed and part-time job residents and others (retired people, students and full-time job residents). Part-time job and unemployed residents did not pay much more attention to “without natural landforms” and “without a stream or a pool”, while other occupational groups showed strong disagreement with these two items.

Thirdly, in the perception and design style section, gender and length of residence had more influence on people’s attitudes than other demographic variables.

Male residents strongly disagreed with “grand” design style, while females showed a relatively neutral attitude. For “simple and practical” and “suitable to the architectural style of residential buildings”, female residents were in stronger agreement, relatively, than the males.

In terms of “grand” and a “simple and practical” design style, the second most important variable was the length of residence. Residents with two years or more length of residence disagreed with a “grand” design style.

With regard to a “simple and practical” design style, although length of residence subgroups agreed with it, residents with a-year-long residency showed relatively low agreement, compared to other groups. What is interesting is that those residents who had lived there for less than a year showed a strong agreement with a “simple and practical” environment than those residents who had lived there for two years or more. This might because a “simple and practical” environment lets them become familiar quickly with the environment. But for those residents with two years or more residency, this meant an easy way to live.

9.3.2 Univariate analysis of the significant predictors at the city level:

Table 9-4: Univariate Analysis Results in Response to Significant Predictors of Actual use for the three cities respectively

	Gender	Age	Length of residence	Number of family members	Income	Occupation	Education	Childhood outdoor environmental use frequency
Hangzhou								
Meet friends	V+	V+		V+		V-		
Take a shortcut				V-		V-		
Without natural landforms						V+		
Many small squares			V+	V+		V-		
A quiet place						V+		
Simple and practical								
Natural						V-		
Shenzhen								
A lawn with tall trees	V+							
Like a forest			V	V+				
A children's play ground with facilities	V+			V+	V+	V-		
Beijing								
Walk dogs			V-			V-	V-	V+
Join in some events	V+				V-			V-
Approach a natural environment	V+							
With many evergreens						V-		
With exercise facilities		V+			V -	V-	V -	

Note:

- 1) V means the K-W test was significant
- 2) "+" or "-" means the correlation was positive or negative

Univariate analysis (K-W test and correlation, Table 8-4) for predictors of actual use in each city found the biggest difference between Beijing and the other two cities was that of education. In Beijing, the education subgroups had a significant influence on most of the predictors of actual use. While in Hangzhou and Shenzhen, education was not significant in terms of the predictors of actual use.

The other difference reflected in the univariate analysis at the city level was the number of family members. In Hangzhou and Shenzhen, there were significant differences between the subgroups, the number of family members, in response to

the predictors of outdoor environmental use. But in Beijing, the attitudinal differences between the same subgroups were not significant at all.

The common point between the three cities was occupation, which influenced most of the predictors of OEUF.

To test whether this result was correct or not, a discriminant analysis was carried out for the three cities, like the dependent and demographic variables as independent. Analysis showed that the significant differences between Beijing and the other two cities were in terms of education and the number of family members, while Shenzhen was different from Beijing and Hangzhou in terms of the average age.

9.4 Hierarchy of Significant Place Characteristics in Response to the Frequency of use of the Outdoor Environment

Answer-Tree analysis sequences variables, according to the effectiveness of the discriminator separating the frequent from infrequent users. Compared to binary logistic regression, answer-tree analysis is more flexible, such that the criteria can be adjusted for needs, thus, it is a complements of the logistic regression. In the hierarchy, each discriminator can discriminate/explain the last one best. The symbol “+” or “-” shows that the number of frequent users in this branch is more or less than the infrequent users.

9.4.1 Answer-Tree Analysis of all Three Cities

9.4.1.1 Demographics

In the demographic section, five discriminators with a 67% accuracy rate constituted the hierarchy. Appendix 9-15 shows the misclassification table between the correct and incorrect numbers. Figure 9-1 indicates the relationships between the demographic variables in response to the frequency of outdoor environmental use.

Frequency of use in childhood of an outdoor environment is the first discriminator at the top of this hierarchy. For those infrequent childhood users, they were more likely to be infrequent adult users, while frequent childhood users were more likely to be

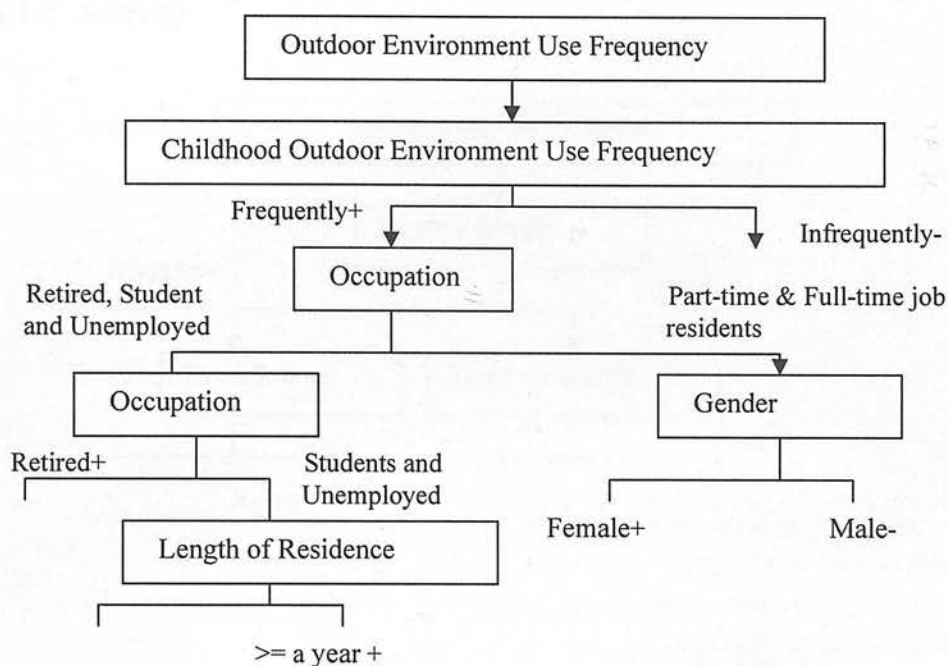


Figure 9-1 Hierarchy of Demographic Variables in Response to the Frequency of Use of the Outdoor Environment (for the three cities taken together)

After frequent users in childhood, occupation was the next discriminator. Employed male respondents (including those in part-time and full-time jobs) were more likely to be infrequent users. For female residents, occupation seemed not to influence their outdoor environmental use frequency after they grew up.

For those frequent users in childhood, the next discriminator was again, occupation. Retired residents were more likely to be frequent users. For students and unemployed respondents, if they had lived in a place for a year or more, they would visit an outdoor environment frequently.

Summary:

Childhood outdoor environmental use frequency was the most important discriminator of the demographic variables. Though actual use is often influenced by occupation, female respondents seemed to keep their childhood habit more so than males. Length of residence was another important discriminator for users. If respondents were familiar with an environment, they were more likely to visit an

outdoor environment frequently than those who were unfamiliar with it (where length of residence was less than a year), especially for those unemployed residents.

9.4.1.2 Activity

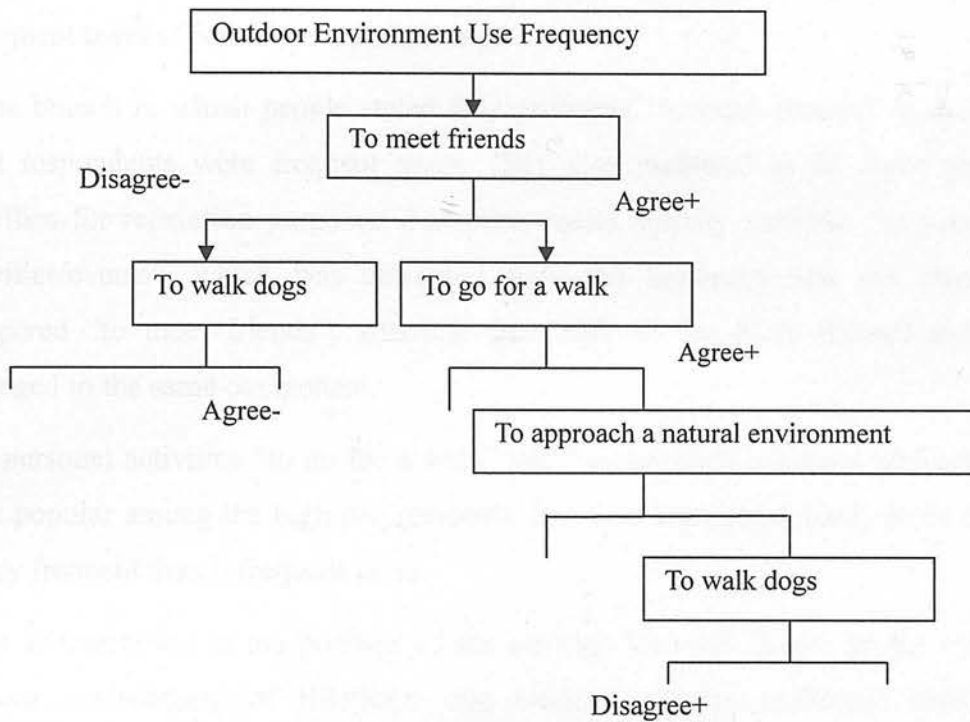


Figure 9-2 Hierarchy of Activity Variables in Response to the Use Frequency of Use of an Outdoor Environment (for the three cities taken together)

With a 62% accuracy rate (Appendix 9-16), five activities made up a hierarchy which discriminated frequent from infrequent users. Figure 9-2 shows the hierarchy of activities which best matched the different user groups.

The first discriminator was “to meet friends”. Frequent users preferred to do this in the CCG. For those residents who disagreed with this, most of them were infrequent users.

In the frequent user branch, the next discriminator was “to go for a walk”. Respondents who preferred to do this activity were more likely to use the CCG frequently. To “approach a natural environment” was the second discriminator, which was followed by “to walk dogs”. Frequent users among the residents who liked to visit the CCG to “approach a natural environment”, disliked “to walk dogs”.

Of those respondents who disagreed with “to meet friends”, the second discriminator

was “to walk dogs”. Respondents who held positive attitudes to dog walking did not visit the outdoor environment frequently.

Summary:

Social interaction such as “to meet friends” can distinguish frequent users from infrequent users efficiently at the first step.

In the branch in which people stated they preferred “to meet friends” in the CCG, most respondents were frequent users. They also preferred to do some personal activities for relaxation purposes. The other social activity variable, “to join some activities/events”, which was discarded from the hierarchy was not important, compared “to meet friends”, although the result of the PCA showed that they belonged to the same component.

The personal activities “to go for a walk” and “to approach a natural environment” were popular among the high-rise residents. But they were more likely to be carried out by frequent than infrequent users.

What is interesting is the position of the activity “to walk dogs”. In the cramped outdoor environment of HRFRA, dog owners’ activity conflicted with other residents’ activity, especially those frequent users. However, for infrequent users, they were unlikely to dislike this activity.

9.4.1.3 Physical Attributes

Seven physical attribute variables explained the actual use with an accuracy rate of 63%. Appendix 9-17 shows the classification table for the correct and incorrect numbers.

Figure 9-3 shows that the first discriminator was “without a stream or a pool”. Frequent users held negative attitudes about this feature, while infrequent users seemed not to mind that environment.

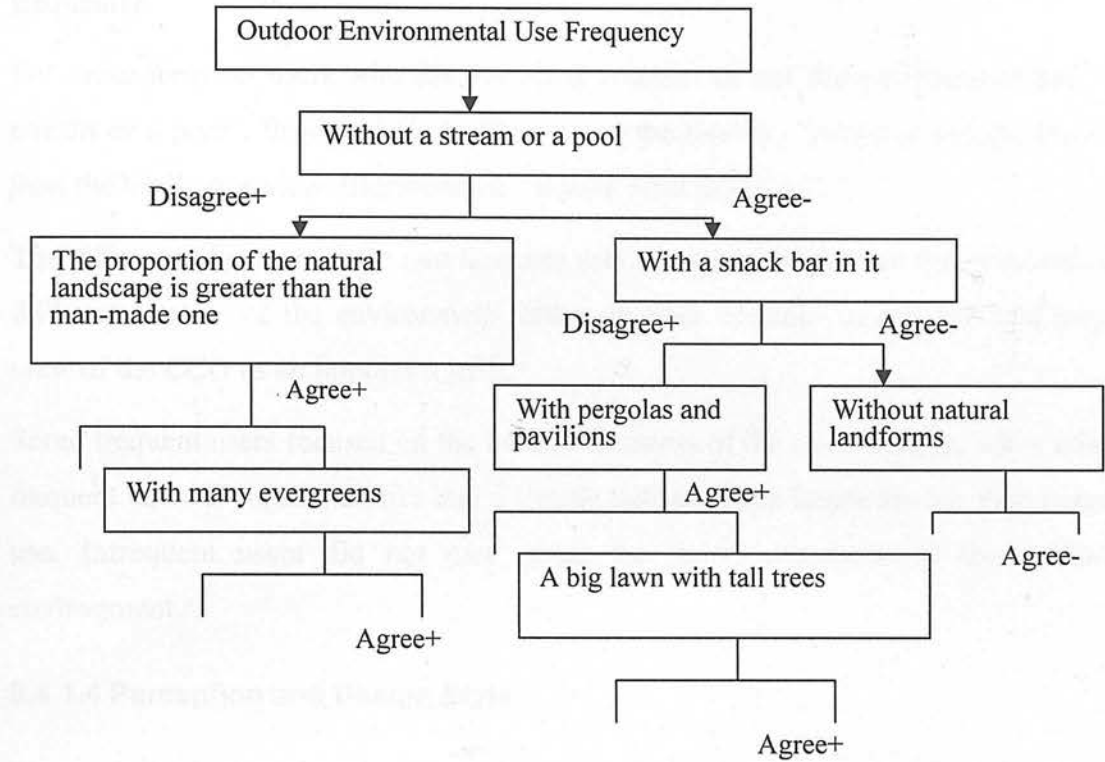


Figure 9-3 Hierarchy of Physical Attributes in Response to the Frequency of Use of the Outdoor Environment (for the three cities taken together)

The next discriminator which frequent users responded to, was the bird’s-eye view variable, “the proportion of the natural landscape is greater than the man-made one”. People who agreed with this tended to visit the CCG frequently. “Many evergreens” can best explain the differences of the third discriminator. Again, frequent users of the CCG preferred a green environment.

In terms of “with a snack bar in it”, respondents who disagreed were more likely to be frequent users. In this branch, “pergolas and pavilions” and “a lawn with some tall trees” were all preferred by frequent users. In the other branch where people liked “a snack bar” in the CCG, most of the respondents were infrequent users and they liked the environment of the CCG “without natural landforms”.

Summary:

Generally speaking, a natural element, like a waterscape, was the most effective discriminator which separated frequent from infrequent users. The outlook of the CCG, when it had a greater proportion of a natural landscape than a man-made one, and with evergreens, seemed to reinforce residents’ tendency to use the CCG

frequently.

For those frequent users who did not mind whether or not the environment had “a stream or a pool”, they paid more attention to the facility, “pergolas and pavilions” than the bird’s-eye view discriminator, “a lawn with tall trees”.

The difference between these two frequent user groups indicates that they focused on different aspects of the environment, although both of them treated the bird’s-eye view of the CCG as an important item.

Some frequent users focused on the natural elements of the environment, while other frequent users thought facilities and a simple outlook were important for their actual use. Infrequent users did not care about the natural elements in the outdoor environment.

9.4.1.4 Perception and Design Style

Although there was a significant difference between the model and data, the Answer-tree analysis results for this section could provide designers with some guidance. With a total accuracy rate of 64%, five discriminators classified the differences for each branch. Appendix 9-18 shows the classification table between the correct and incorrect numbers. The relationship between the discriminators in response to actual use can be seen in Figure 9-4.

The first discriminator was “suitable to the style of the residential buildings”. It showed a clear separation between frequent and infrequent users. Under ‘disagree’, most of the respondents were infrequent users; under ‘agree’, most of the respondents were frequent users.

For residents who disliked the design style which was “suitable to the style of the residential buildings”, the next discriminator was a “simple and practical” design style, followed by a “comfortable” perception. Residents who held negative attitudes to these two discriminators were more likely to be infrequent users.

For those residents who liked the design style of the CCG which was suitable to the architectural style of the residential buildings, a “grand” design style was the next discriminator.

Residents who disagreed with this were frequent users. The next discriminator was “comfortable”, followed by “simple and practical” and an “informal” design style. If people held positive attitudes about them, most of them were frequent users. For those who liked a “grand” design style, most were infrequent users. They held a negative attitude to an “informal” design style as those residents disliked “suitable to the style of the residential buildings”.

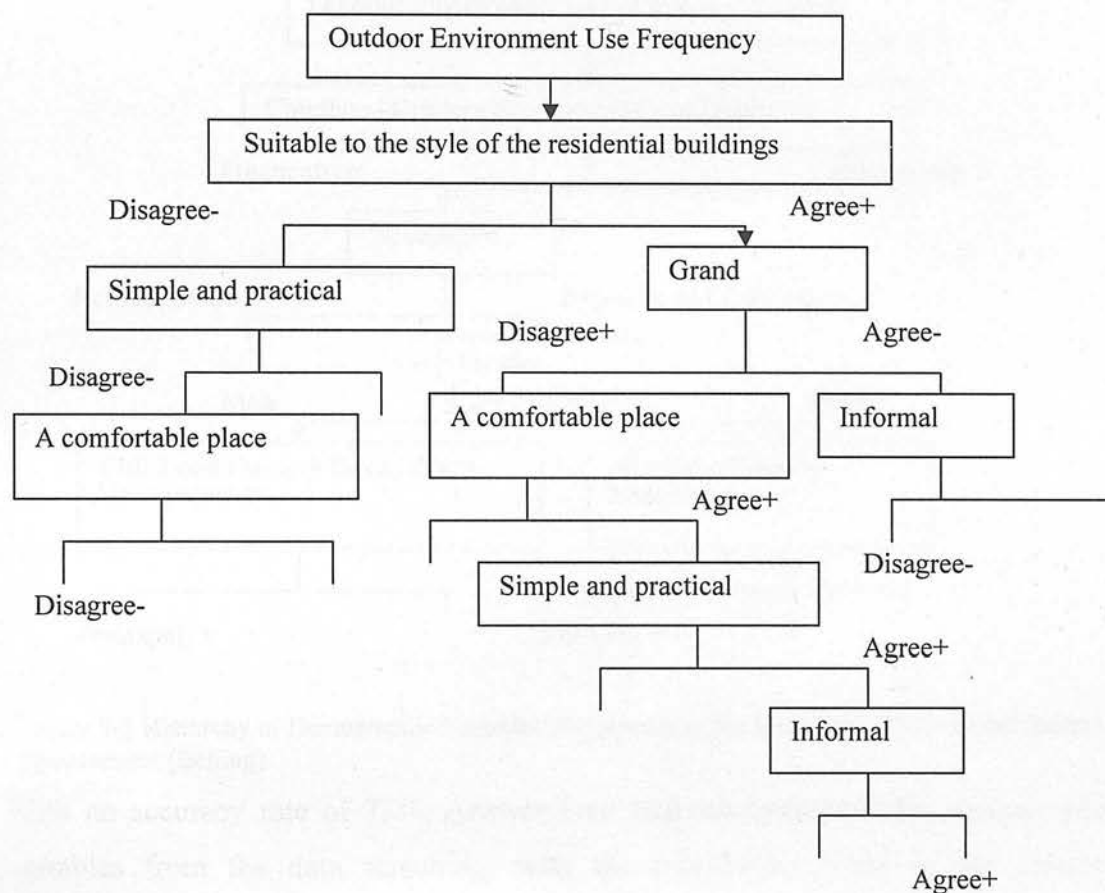


Figure 9-4 Hierarchy of Perception&Design Style Variables in Response to the Frequency of Use of the Outdoor Environment (for the three cities taken together)

Summary:

In the perception and design style section, the number of discriminators from the design style category was greater than for the perception category.

In general, the design style discriminators “suitable to the style of the residential buildings”, “simple and practical” and “informal” were all linked to the perception, “comfortable” by frequent users. Conversely, “grand” was the negative design style for most frequent users and was connected with infrequent users.

9.4.2 Answer-tree Analysis at City Level

9.4.2.1 Beijing

1. Demographics

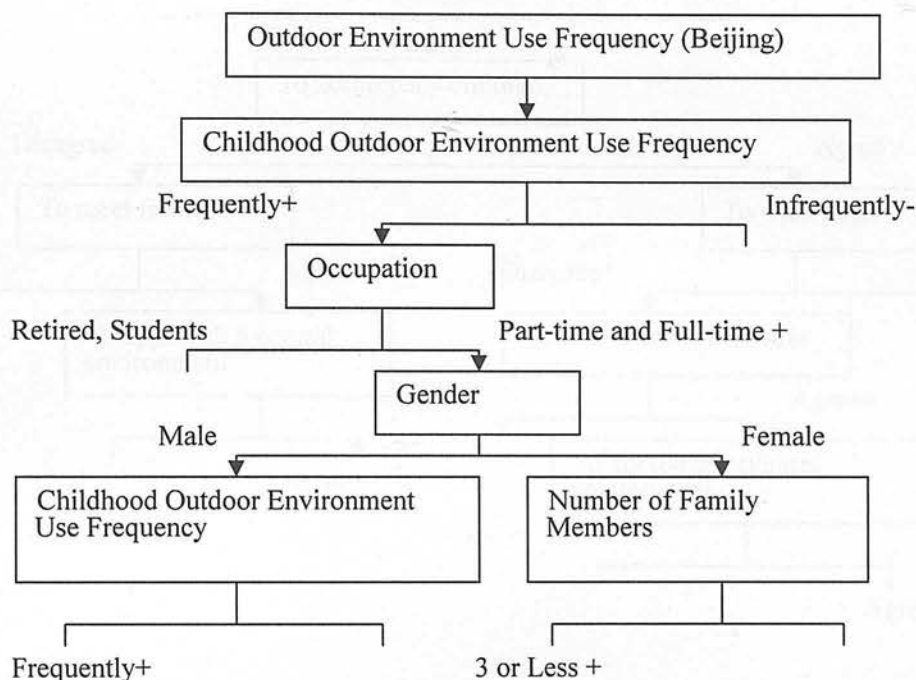


Figure 9-5 Hierarchy of Demographic Variables in Response to the Frequency of Use of the Outdoor Environment (Beijing)

With an accuracy rate of 73%, Answer-Tree analysis sequenced the demographic variables from the data screening, with the frequency of use of the outdoor environment as the target variable (Appendix 9-19).

Frequency of use in childhood of an outdoor environment was the most important discriminator and was put at the top of this hierarchy (Figure 9-5). Those residents who visited the outdoor environment on a daily and weekly basis as children were more likely to visit the CCG on a daily basis as adults. In contrast, the frequency of users who had been infrequent childhood users was the same after they grew up.

Of those adult daily users on the left branch, and where frequent users were in the majority, the next discriminator was occupation. Retired residents and students visited the CCG frequently. For employed residents, the next discriminator was

Chapter 9: An Investigation of Demographic and Attitudinal Variables Discriminating Use of the CCG

gender. Females with three or less family members were more likely to be daily users. Male residents who visited the outdoor environment in childhood on a daily basis were more likely to be frequent adult users of the CCG.

2. Activity

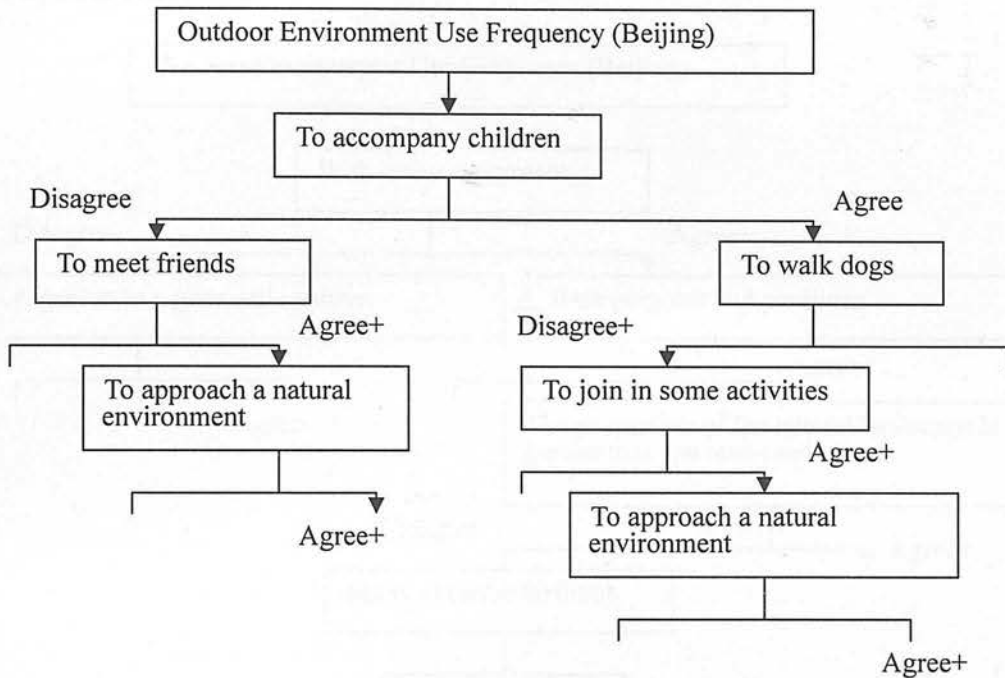


Figure 9-6 Hierarchy of Activity Variables in Response to the Use Frequency of Use of the Outdoor Environment (Beijing)

With a total accuracy rate of 71% (Appendix 9-20), Figure 9-6 shows the hierarchy of activity variables in response to actual use.

In the activity category, the first discriminator was “to accompany children”. For those who disliked “to accompany children”, “to meet friends” was the second activity which frequent users often liked to do. In this branch, the next activity was to “approach a natural environment”.

For those residents who liked “to accompany children”, the next discriminator was “to walk dogs”. Most of the frequent users disliked this activity. In this branch, the frequent users liked “to join some activities” and “to approach a natural environment”.

This hierarchy shows that whether or not a family has children or a dog might

Chapter 9: An Investigation of Demographic and Attitudinal Variables Discriminating Use of the CCG influence the frequency of use of family members. Compared to other activities, social activities such as “to join some activities” and “to meet friends” might be more effective than those personal optional activities such as “to approach a natural environment”, in order to identify frequent from infrequent users.

3. Physical Attributes

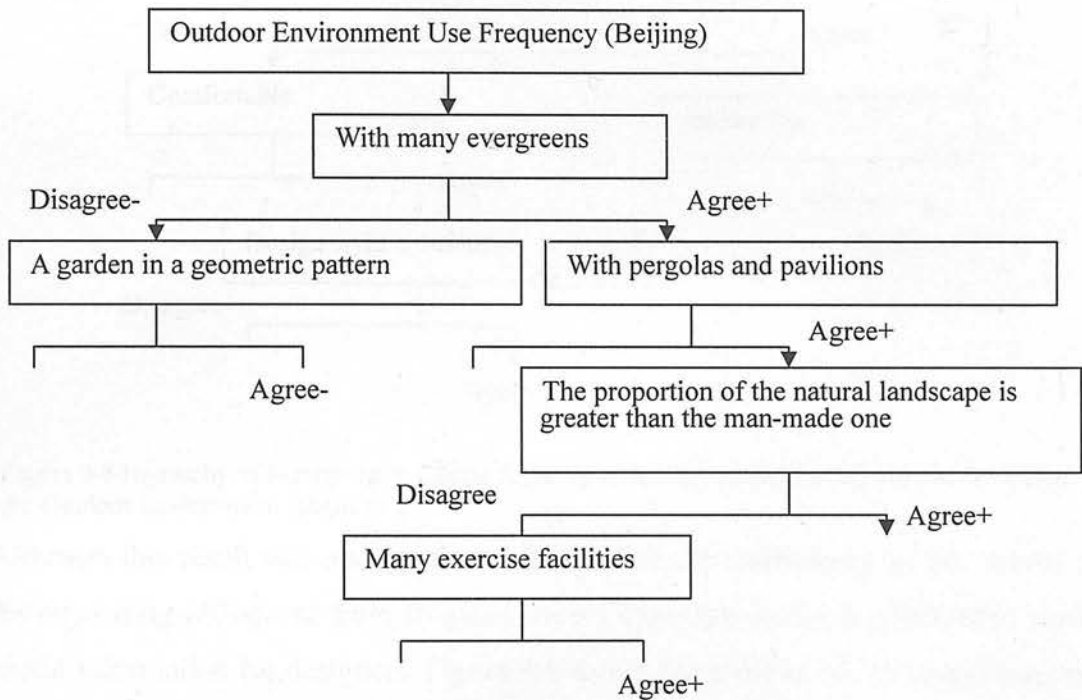


Figure 9-7: Hierarchy of Physical Attributes in Response to the Frequency of Use of the Outdoor Environment (Beijing)

Answer-Tree analysis provided a clear hierarchy in the physical attributes section, with an accuracy rate of 71%. With “evergreen” as the first discriminator, frequent and infrequent users were divided into two branches (Figure 9-7)

The left-hand branch was dominated by infrequent users who disliked “many evergreens” in the CCG. These residents liked the CCG to be organised in a “geometric pattern”.

For those residents who liked “many evergreens” in the CCG, the next discriminator was “pergolas and pavilions”. Residents who held positive attitudes about these items were more likely to be frequent users. In this branch, the next discriminator was “the proportion of the natural landscape is greater than the man-made one”. Frequent users liked this view, but for those frequent users who disliked it, they paid

4. Perception and Design Style (insignificant)

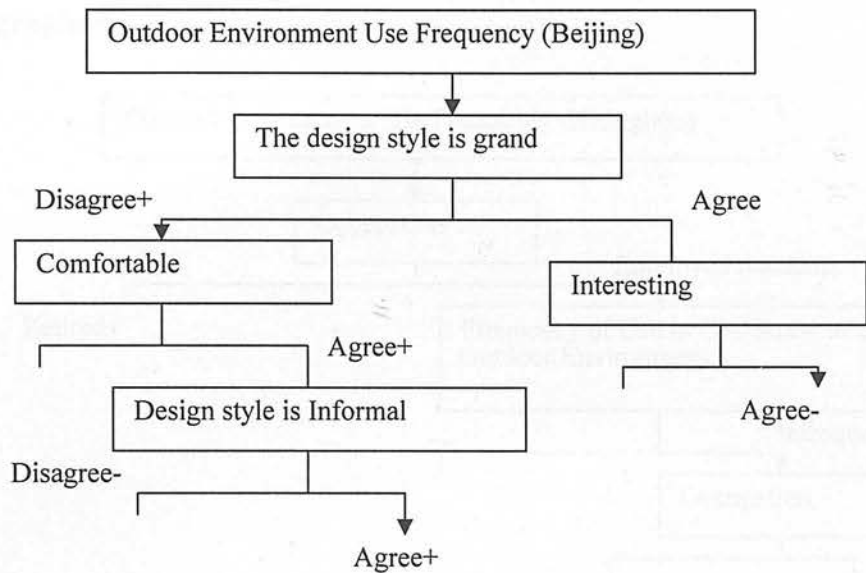


Figure 9-8 Hierarchy of Perception & Design Style Variables in Response to the Frequency of Use the Outdoor Environment (Beijing)

Although this result was not significant because of the inefficiency of this model in distinguishing infrequent from frequent users (Appendix 9-22), it could offer some useful information for designers. Figure 9-8 shows the order in which perception and design style discriminators matched different user groups.

The first discriminator was “grand” design style. Of the residents who disliked this design style, frequent users were in the majority. They preferred a “comfortable” environment and an “informal” design style.

For those who liked a “grand” design style, most of them were infrequent users. In this branch, the next discriminator was “interesting”. Residents who liked to have an “interesting” perception of the outdoor environment might visit it infrequently.

9.4.2.2 Hangzhou

1. Demographics

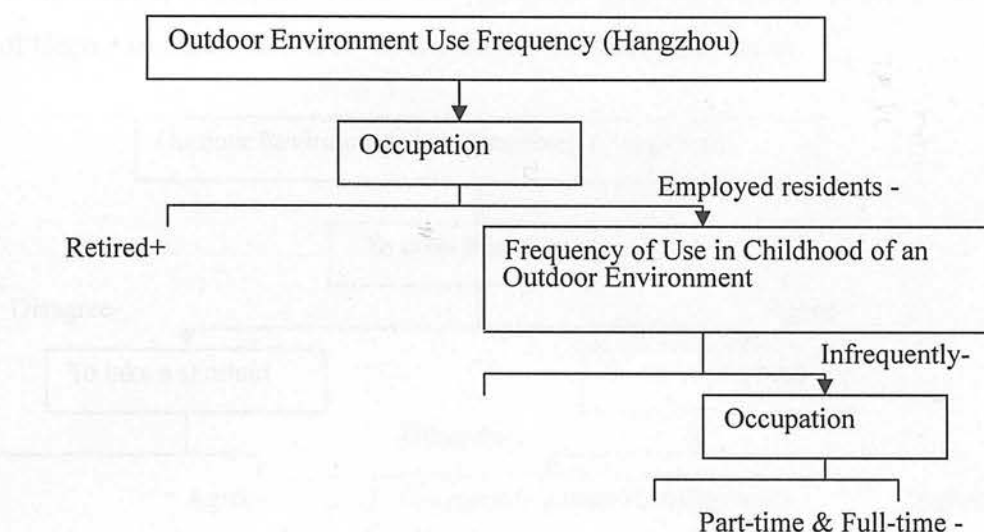


Figure 9-9 Hierarchy of Demographic Variables in Response to the Frequency of Use of the Outdoor Environment (Hangzhou)

There were no significant differences between the model and the real data. The total accuracy rate of this hierarchy was 64% (Appendix 9-23). Figure 9-9 shows that occupation was the first discriminator. Retired residents were frequent users of the environment, while employed residents were more likely to be infrequent users.

In the branch in which infrequent users were the majority, childhood outdoor environmental use frequency was the second discriminator. For those residents who had visited infrequently an outdoor environment in childhood, they did not visit the CCG frequently as adults, especially those residents who had jobs.

2. Activity

The accuracy rate of the activity hierarchy was 63% in total (Appendix 9-24). This model was approximate to the real data. Figure 9-10 shows the effectiveness of discriminators that matched the frequency of use of the outdoor environment.

The social activity “to meet friends” was the first discriminator. People who liked to “meet friends” in the CCG were more likely to be frequent users. In this branch, the

next discriminator was “to take a shortcut”. Frequent users disliked this activity. For these residents, personal activity such as “to approach a natural environment” was the next activity which frequent users liked to undertake.

On the other hand, infrequent users often disliked “to meet friends” in the CCG. For most of them, “to take a shortcut” in the CCG was their preference.

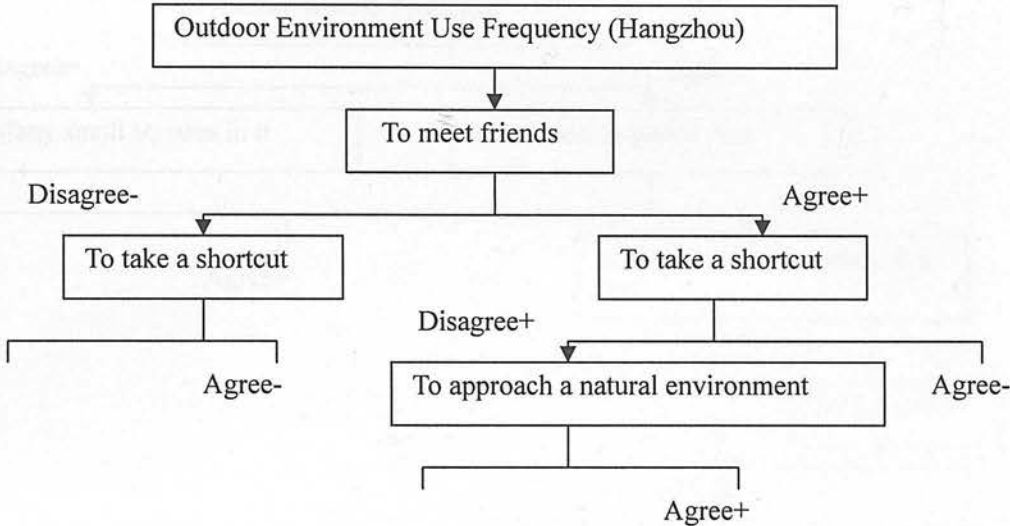


Figure 9-10 Hierarchy of Activity Variables in Response to the Frequency of Use of the Outdoor Environment (Hangzhou)

3. Physical Attributes

The total accuracy rate of the hierarchy discriminating the different frequency of users was 64% (Appendix 9-25). Figure 9-11 shows the order of the discriminators which matched best the different user groups.

Similar to Beijing, the first discriminator came from the natural element category -“without natural landforms”. People who disliked this were more likely to be infrequent users of the outdoor environment. For those who disagreed that the CCG should be “without natural landforms”, most of them were frequent users (Figure 9-11).

For those frequent users who disliked the environment “without natural landforms”, the next discriminator was “many small squares”. These hard-surface sites can provide multi-purpose usage for residents, especially for frequent users.

For those residents who liked the outdoor environment “without natural landforms”, the next discriminator was “many small squares”. In this branch, if they disliked

having a waterscape in the environment, they were more likely to be infrequent users. For them, the next discriminator was a bird's-eye view "like a forest". Infrequent users disliked the natural appearance of the CCG.

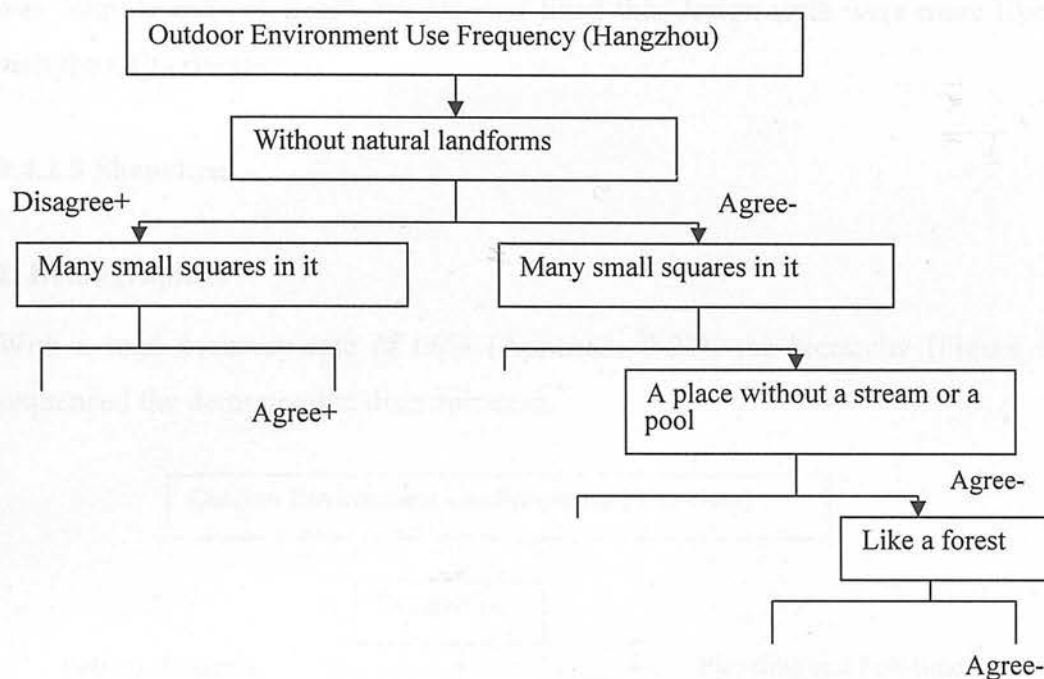


Figure 9-11 Hierarchy of Physical Attributes in Response to the Frequency of Use of the Outdoor Environment (Hangzhou)

4. Perception & Design Style

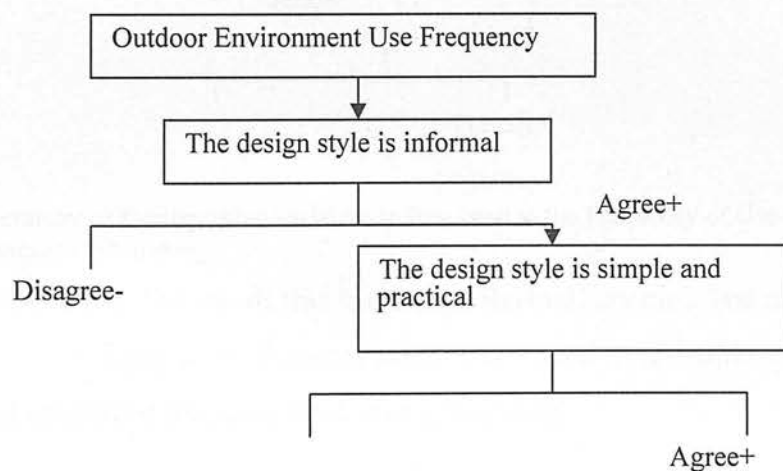


Figure 9-12 Hierarchy of Perception & Design Style Variables in Response to the Frequency of Use of the Outdoor Environment (Hangzhou)

With an accuracy rate at 59%, the hierarchy (Figure 9-12) teased out two discriminators in Hangzhou (Appendix 9-26). The first discriminator was the design

Chapter 9: An Investigation of Demographic and Attitudinal Variables Discriminating Use of the CCG style variable - “informal”. Residents who liked an “informal” design style were frequent users, however, infrequent users disliked this design style.

For those frequent users who liked an informal design style, the next discriminator was “simple and practical”. People who liked this design style were more likely to visit the CCG frequently.

9.4.2.3 Shenzhen

1. Demographics

With a total accuracy rate of 66% (Appendix 9-27), the hierarchy (Figure 9-13) sequenced the demographic discriminators.

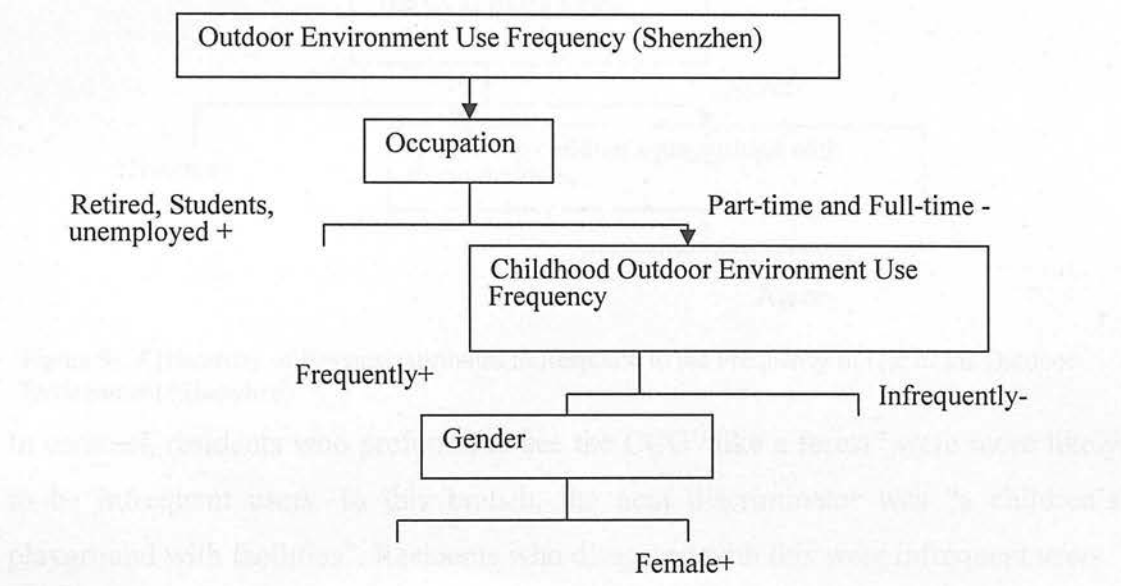


Figure 9-13 Hierarchy of Demographic Variables in Response to the Frequency of Use of the Outdoor Environment (Shenzhen)

Occupation was first at the top of this hierarchy. Retired, unemployed residents and students were more likely to be frequent users. Compared to unemployed residents, the majority of employed residents were infrequent users.

In the infrequent user branch, the next discriminator was frequency of use in childhood of the outdoor environment. For residents who were daily users in childhood, they were more likely to be frequent users as adults. For those infrequent childhood users, they were more likely to visit an outdoor environment infrequently

For those frequent users in childhood, the next discriminator was gender. Females would visit an outdoor environment more frequently than males as adults.

2. Physical Attributes

The hierarchy of Shenzhen (Figure 9-14) is composed of two significant discriminators, with a total accuracy rate of 65% (Appendix 9-28).

The first discriminator was the bird’s-eye view item, “like a forest”. Frequent users disliked this outlook and showed negative attitudes to this view.

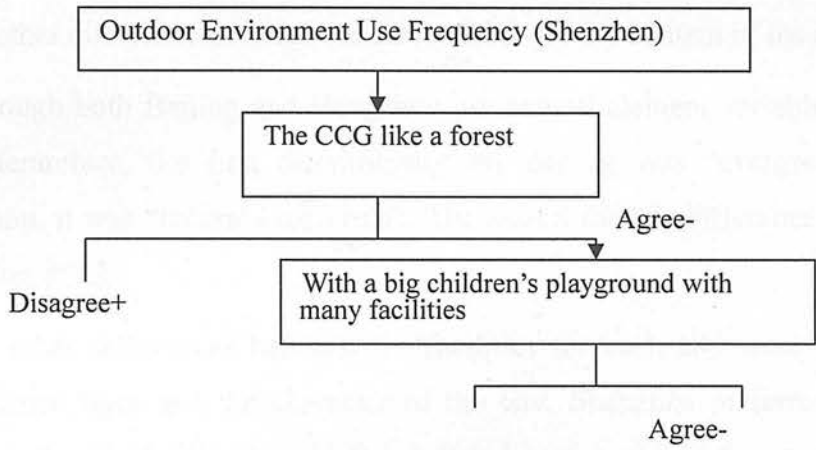


Figure 9-14 Hierarchy of Physical Attributes in Response to the Frequency of Use of the Outdoor Environment (Shenzhen)

In contrast, residents who preferred to see the CCG “like a forest” were more likely to be infrequent users. In this branch, the next discriminator was “a children’s playground with facilities”. Residents who disagreed with this were infrequent users.

Summary: Similarities and differences between the cities

Table 9-5 presents a summary of these issues. Given that the accuracy rates of activity, the perception and design style categories in Shenzhen were not ideal, the results of the two sections were excluded from the comparison. Table 9-5 only lists the Answer-tree analysis results from the demographic and physical attributes sections for the three cities.

- 1. The sequence of the discriminators was as follows:
 - 1) In all three cities, frequency of use in childhood of an outdoor environment and

occupation were the first two discriminators at the top of the hierarchy. Of the three cities, only Beijing was unvarying in the degree to which the integrated data regarding frequency of use in childhood was the first discriminator. In Hangzhou and Shenzhen, the first discriminator was occupation.

2) In the physical attributes section, the general sequence of the discriminators in Beijing and Hangzhou was similar. The first two discriminators came from the natural elements category, which was followed by the facilities and bird's-eye view items. However, in Shenzhen, the first discriminator was from the bird's-eye view category and was followed by the facilities item.

2. The other difference between the three cities was the content of the discriminators.

1) Although both Beijing and Hangzhou put natural element variables at the top of their hierarchies, the first discriminator for Beijing was "evergreen", while for Hangzhou, it was "natural landforms". The reason for this difference was explained in Section 8.2.2.

2) The other differences between the facilities for each city were relevant to the respondents' ages and the character of the city. Shenzhen preferred a "children's playground with facilities", which correlated to the age of the respondents. As a young city, most of the residents were young people who were of an age where they are looking after children, thus this facility was preferred the most by frequent users and females.

In Hangzhou and Beijing, the average ages were relatively higher than Shenzhen. The need for a children's playground, as reflected in the different age groups of Beijing and Hangzhou, was not felt as keenly as Shenzhen. In Beijing and Hangzhou, middle-aged and older people, as the main group of outdoor environment users, aimed to have a relaxing time and to accompany children, therefore, the need for rest and exercise facilities and for other purposes seemed important to people.

Table 9-5: Comparison between the Cities (results of the Answer-Tree Analysis)

Demographic		Physical Attributes	
	Beijing	1st discriminator	Childhood Outdoor Environmental Use Frequency
		2nd discriminator	Occupation
	Shenzhen & Hangzhou	1st discriminator	Occupation
		2nd discriminator	Childhood Outdoor Environmental Use Frequency
	Similarities		
	1st Discriminator-Natural related variables		
	2nd Discriminator-Facility related variable		
	Different properties of Discriminators	Beijing & Hangzhou	Natural elements
		Shenzhen	Bird's-eye view
	Sequence of Discriminators	Beijing & Hangzhou	Natural elements followed by facilities, then bird's-eye view
Differences		Shenzhen	Bird's-eye view followed by facilities
		Beijing	Evergreens
		Hangzhou	Natural landforms
	Contents of Discriminators	Beijing	Pergolas and pavilions , and exercise facilities
		Hangzhou	Small squares
		Shenzhen	Children's playground and facilities

9.5 Behaviour Settings for Different Uses (for all three cities)

A series of logistic regressions were carried out to identify the physical and perceptual characteristics suitable for different activities. Comparisons between the predictors of these activities are summarised at the end of this section.

1) "To go for a walk"

The H&L test showed that there was no significant difference between the data and the model (H&L test, Chi-square=7.194; P-value=.516). It can be used to predict people's activity. With a 74.4% accuracy rate (Appendix 9-29), seven physical attribute variables were obtained in response "to go for a walk". They are:

"The proportion of the natural landscape is greater than the man-made one (Wald =59.591, p-value=.000, Exp(b)=3.443);

"A big lawn with some trees (Wald =6.701, p-value=.010, Exp(b)=1.325);

"Like a forest" (Wald= 6.927, p-value=.008, Exp(b)=1.318);

"A medium-sized place where I can walk around it in 15 minutes" (Wald =18.006, p-value=.000, Exp(b)=1.517);

"A place with many evergreens" (Wald =14.702, p-value=.000, Exp(b)=1.835);

"Many exercise facilities" (Wald =4.028, p-value=.045, Exp(b)=.770);

"A snack bar in it" (Wald =4.6, p-value=.032, Exp(b)=.824);

For residents who liked "to go for a walk", these physical characteristics can improve the tendency for this activity to occur, except "a snack bar" (Exp(b)=.824) and "exercise facilities" (Exp(b)=.770).

In the perception and design style section (Appendix 9-30), the model obtained three predictors:

"A quiet place" (Wald=48.839, p-value=.000, Exp(b)=3.293);

The design style of the CCG is "grand" (Wald= 8.508, p-value= .004, Exp(b)= .774);

The design style of the CCG is “informal” (Wald= 22.221, p-value= .000, Exp(b)= 2.278);

Residents preferred the feeling of “quietness” and an “informal” design style. The “grand” design style reduced the possibility of visiting the outdoor environment for relaxation purposes.

2) “To walk dogs”

There were seven predictors which had a significant influence on the activity “walking dogs”.

With a 63.1% accuracy rate (Appendix 9-31), the model was approximate to the real data (H&L test, Chi-square=11.382; P-value=.181). In the model, three predictors came from the area & safety category, two from the facilities category.

The size of the CCG which “I can walk around it in 7 minutes” (Wald= 5.004, P-value=.025, Exp(b)=1.217) and “I can walk around it in 30 minutes” (Wald=23.368, P-value=.000, Exp(b)=1.620) can increase preference levels in terms of “to walk dogs”.

The CCG “without passers-by” (Wald=7.082, P-value=.008, Exp(b) = 1.236) is preferred by the residents who liked “to walk dogs”.

In the facilities category, residents who liked “to walk dogs” showed a preference for “a children’s playground with facilities” (Wald= 4.091, P-value= .043, Exp(b)= 1.212) and “with a snack bar in it” (Wald= 21.021, P-value= .000, Exp(b)= 1.428).

In the perception & design style section, the predictive model was approximate to the real data (H&L test, Chi-square =5.630; P-value=.689), with a total accuracy rate of 58.8% (Appendix 9-32).

Two predictors, a “grand” (Wald=5.618, P-value=.018, Exp(b)=1.219) and a “fashionable and leading” design style (Wald=3.925, P-value=.048, Exp(b)=1.212) were preferred by residents who liked “to walk dogs”, although they were not popular in the other user groups.

3) “To meet friends”

The H&L test showed that there was no significant difference between the model and

the real data (H&L test, Chi-square =12.143; P-value=.145). With a total accuracy classification rate of 64.6% (Appendix 9-33), the model teased out four predictors from the physical attributes section.

The physical settings suitable for “meeting friends” comprised two predictors from the bird’s-eye view category and two from the facilities category. “A garden in a geometric pattern” (Wald=5.157, P-value=.023, Exp(b)=1.239) and “landscapes with vivid colours” (Wald=3.846, P-value=.050, Exp(b)=1.185) from the bird’s-eye view category increased the preference level of the residents.

The other two variables - the CCG “with many small squares” (Wald=6.523, P-value=.011, Exp(b)=1.264) and “with pergolas and pavilions” (Wald=9.198, P-value=.002, Exp(b)=1.496) also increased the preference levels.

In the perception & design style section, no predictors had a strong influence on this activity, because the null hypothesis was denied (H&L test, Chi-square =20.2; P-value=.007).

4) “To do some exercises”

In the physical attributes section, the H&L test shows that there was no significant difference between the model and the real data (H&L test, Chi-square=12.051, P-value=.149). The total percentage was 71.1% (Appendix 9-34).

The suitable physical settings for “to do some exercises” included six variables. Two came from the bird’s-eye view category - “the proportion of the natural landscape is greater than the man-made one” (Wald=19.559, P-value=.000, Exp(b)=1.604), “a big lawn with tall trees” (Wald=4.433, P-value=.035, Exp(b)=1.217). Both had a positive influence on people’s exercise behaviours.

A predictor came from the natural element category - “many evergreens” (Wald=5.93, P-value=.015, Exp(b)=1.381). The influence of “evergreens” on peoples’ exercise behaviour was positive.

The next three came from the facilities category - “a children’s playground with facilities” (Wald=4.794, P-value=.029, Exp(b)=1.215), “pergolas and pavilions” (Wald=8.161, P-value=.004, Exp(b)=1.510) and “many exercise facilities” (Wald=8.041, P-value=.005, Exp(b)=1.401).

5) "To accompany children"

There was a significant difference between the data and predictive model, with the result of the H&L test, Chi-square =31.353; P-value=.000.

6) "To approach a natural environment"

The H&L test showed that there was no significant difference between the model which was based on physical attributes and the real data (H&L test, Chi-square=10.533; P-value=.23). With a 79.5% classification accuracy rate (Appendix 9-35), six predictors had a significant influence on the activity "to approach a natural environment".

"The proportion of natural landscape is greater than a man-made one" (Wald= 60.677, P-value= .000, Exp(b)= 2.962) and "like a forest" (Wald= 4.014, P-value=.045, Exp(b)=1.236) came from the bird's-eye view category. Both of them can enhance residents' wishes "to approach a natural environment".

"Without cars running through" (Wald=10.583, P-value=.001, Exp(b)= 1.464) can increase the preference level "to approach a natural environment".

"Without a stream or a pool" (Wald=4.966, P-value=.026, Exp(b)=.799) and "many evergreens" (Wald=44.241, P-value=.000, Exp(b)=2.95) came from the natural elements category. Residents preferred an environment with waterscapes and evergreens which can increase their activity in terms of approaching a natural environment.

"A children's playground with facilities" (Wald=3.972, P-value=.046, Exp(b)=1.233), and "with pergolas and pavilions" (Wald=9.473, P-value=.002, Exp(b)=1.697) were two variables from the facilities category. Both variables can increase residents' wish "to approach a natural environment".

In the perception & design style section, the model was approximate to the data (H&L test: Chi-square=13.342; P-value=.101) (Appendix 9-36) with an accuracy rate at 72%.

The characteristics "quiet" (Wald=14.79, P-value=.000, Exp(b)=1.614), "comfortable" (Wald=22.49, P-value=.000, Exp(b)=2.014), and an "informal" design style (Wald=19.20, P-value=.000, Exp(b)=1.951) were connected to the activity, "to

approach a natural environment". "Vibrant" (Wald=3.879, P-value=.049, Exp(b)=1.245) was another characteristic of place that was preferred also by residents who liked to approach a natural environment. This result showed that both a lively and quiet sense of an environment was preferred by residents when they wanted to relax.

With $F=13.579$, $P\text{-value}=.000$, six physical environmental characteristics contributed to the sense "vibrant", including "the proportion of the natural landscape is greater than the man-made one" ($\text{Beta}=.138$, $t=3.99$, $P\text{-value}=.000$), "a geometric pattern" ($\text{Beta}=.087$, $t=2.583$, $P\text{-value}=.010$), "landscape with vivid colours" ($\text{Beta}=.097$, $t=2.804$, $P\text{-value}=.004$), "many plants" ($\text{Beta}=.090$, $t=2.463$, $P\text{-value}=.014$), "a children's playground and facilities" ($\text{Beta}=.092$, $t=2.67$, $P\text{-value}=.008$) and "exercise facilities" ($\text{Beta}=.075$, $t=2.907$, $P\text{-value}=.036$).

From the predictors of a "vibrant" feeling, the researcher found that this kind of environment included three aspects: lush plants, a view with a geometric pattern and vivid colours, and facilities suitable for energetic activities, such as a children's playground and exercise facilities.

This result explains the factor analysis result in Section 8.1, namely, why a vibrant feeling belonged to the comfort environmental components and why it deepened people's understanding of their environmental preferences and especially, the meaning that plants had for them. Plants are often associated with a natural, relaxing, quiet and comfortable feeling about an environment. They might also imply a vibrant and lively sense in many residents' eyes.

7) "To take a shortcut"

There was no significant difference between the model based on the physical attributes and real data (Appendix 9-37), the null hypothesis was accepted. Two predictors were significant for this activity, "a small place where I can walk around it in 7 minutes" (Wald=15.861, $P\text{-value}=.000$, Exp(b)=1.403), and "a snack bar" in the CCG (Wald=15.496, $P\text{-value}=.000$, Exp(b)=1.348).

People who liked "to take a shortcut" through the CCG were concerned very much with its size. They preferred the size of the CCG to be small so they could pass

through it easily. The other variable was a “snack bar” which was preferred by these residents as well.

With a 58.6% accuracy classification rate (Appendix 9-38), the perception and design style variables that related to this behaviour were: “a comfortable place” (Wald=12.526, P-value=.000, Exp(b)=.686), “an interesting place” (Wald=3.928, P-value=.047, Exp(b)=1.216), and a “grand” design style (Wald=6.392, P-value=.011, Exp(b)=1.240).

Residents who preferred “to take a shortcut” disliked the “comfort” environments. This might be because they did not use the environment quite so often and did not care about this aspect. Most of these residents were young, single people. They preferred the “grand” design style and the “interesting” perception, which were not popular among the other groups.

8) “To join in some events”

The H&L test showed that there was no significant difference between the model built on physical attributes and the real data (Chi-square=12.13, P-value=.146), thus the null hypothesis was accepted. The model had a total accuracy rate of 59.9% (Appendix 9-39).

In the physical attributes section, the predictor a CCG with “a geometric pattern” (Wald=4.938, P-value=.026, Exp(b)=1.208), “many small squares” (Wald=3.896, P-value=.048, Exp(b)=1.117), and “many exercise facilities” (Wald=3.924, P-value=.048, Exp(b)=1.213) had a significant influence on the activity “to join events”.

All three physical environmental characteristics can increase residents’ inclination “to join in some events/activities”. Of these three predictors, “a geometric pattern” was from the bird’s-eye view category, while “many small squares” and “exercise facilities” came from the facilities category.

In the perception & design style section, the model only teased out one predictor, “interesting” (Wald=10.08, P-value=.002, Exp(b)=1.294) (Appendix 9-40). This predictor could increase the possibility of residents’ “joining some events/activities”.

Summary:

When the behaviour settings were analysed by the researcher to see which were suited to the different activities, he found that the three activity groups needed to have an environment with different characteristics. “To go for a walk”, “do some exercises”, and “to approach a natural environment” can be put into one group; “to join in some events/activities” and “to meet friends” could go in another group, and “to walk dogs” and “to take a shortcut” could be put in the third group.

The first group included personal activities for relaxation purposes. The number of predictors suitable for these activities was greater than for the other two groups. These predictors included variables from the bird’s-eye view and the natural elements categories, which were not often significant in terms of the activities in the other two groups.

Residents thought that the natural outlook of an environment (“the proportion of the natural landscape is greater than the man-made one” and “with many evergreens”) and if it was perceived as “quiet” and had an “informal” design style, then these things supported relaxation in the CCG, usually.

In the second group, social activity was dominant. Although behaviours in this group were influenced by the bird’s-eye view variables, these activities were livelier than those in the first group. “Vibrant” and “interesting” feelings that were associated with physical forms such as “geometric patterns” and “vivid colours” were preferred by residents who liked to join in some social events.

Behaviour settings for the third group of activities indicated that people paid more attention to the size of the CCG. Its size and the number of family members had a big influence on residents’ activities such as “to take a shortcut” and “to walk dogs”. Compared to the first and second activity groups, most of the respondents who liked to enjoy these two activities were single people or young couples without children. The other difference distinguishing this group from the others was the design style “grand”. Respondents who liked to “take a shortcut” and “walk dogs” often preferred the “grand” design style while it was not popular among the other activity groups.

9.6 Elements Influencing the Judgement Importance of the Outdoor Environment

The general judgment importance involved an assessment of the important levels of all the environmental categories. In terms of the analysis of the general judgment importance predictors, the author has taken into account possible inflation which was caused between the preferred environment and the subjective appraisal. The results of this section can provide some useful information for designers.

The K-W test showed that there was no significant difference between the general judgment importance of the environment with actual use. The correlation between them was insignificant. These results showed that the actual use of the CCG was not influenced by the general judgment importance of the HRFRAs in this study.

In the demographic section, gender (Wald= 4.625, P-value= .032, Exp(b)= 1.354) and age (Wald= 4.439, P-value= .037, Exp(b)= 1.264) were two general judgment importance predictors; female residents and older people were more likely to give a high evaluation level to a CCG.

The activities “to go for a walk” (Wald=4.603, P-value=.032, Exp(b)=1.224), “to accompany children” (Wald=3.855, P-value=.050, Exp(b)=1.209) and “to approach a natural environment” (Wald=4.527, P-value=.033, Exp(b)=1.253) increased the general judgment importance.

In the physical attributes section, in terms of the size of the CCG as, “a place I can walk around in 30 minutes” (Wald=7.801, P-value=.005, Exp(b)=1.268); safety, “without a car passing through” (Wald=7.39, P-value=.007, Exp(b)=1.278); and facility, “a children’s playground with facilities” (Wald=6.31, P-value=.012, Exp(b)=1.234) all had a positive influence on people’s general judgment importance.

The perception “vibrant” (Wald=5.74, P-value=.017, Exp(b)=1.27) and an “informal” design style (Wald=5.13, P-value=.023, Exp(b)=1.33) could increase residents’ evaluation levels.

Summary: differences between the predictors of actual use and the general judgement importance

1 Differences in the Demographics:

Gender is a significant predictor of general judgment importance and actual use. Females are more likely to give high marks to an environmental assessment and use the environment more frequently than males.

In people's daily lives, the actual use of the outdoor environment is more likely to be restricted by factors such as occupation and length of residence. Compared to actual use, the number of general judgment importance predictors is fewer. This situation indicates that a general judgment importance, subjectively, is not restricted by the actual conditions so much by actual use.

Of the different age groups, the older the person is, the more likely he/she is to be satisfied with the environment. Compared to older people, young and middle-aged residents are relatively difficult to satisfy in terms of the environment.

2 Differences in Activity:

The activity category has overlaps between the predictors of actual use and the general judgment importance. To "go for a walk" and "to approach a natural environment" are two activities which were preferred by residents who have often gave high appraisals.

3 Differences in the Physical Attributes:

There are two differences between the general judgment importance and actual use.

The first difference is that there is no significant bird's-eye view predictor for the general judgment importance. In respect of actual use, "a big lawn with tall trees" has a positive influence on people. This difference might be interpreted as the aesthetics influencing people's subjective appraisals.

The second difference is that the natural elements "landform" and waterscape "stream and pool" are important predictors of actual use, while for the general judgment importance predictors, they all came from the facility and area&safety categories.

The significance of this difference might mean that designers need to distinguish residents' requirements at different stages. Residents often emphasised the functional aspects of the facilities and underestimated the natural elements, however, the situation is reversed in terms of actual use. The natural element is the main factor which residents need in actual use. The facility and safety & area aspects are relatively less important to people in this situation and act to increase their subjective appraisals. The hierarchy of the physical attributes in response to actual use indicates this fact (Section 9.3).

This difference implies that people can tolerate the inconvenience of the facility and area & safety categories in actual use to some degree, although they often pay much attention to these aspects.

4 Differences in perception and design styles:

The difference is that a general judgment importance can be influenced by the perception "vibrant", but actual use will not be.

The author's further analysis results showed that in terms of an environment's "vibrancy" and what can improve that feeling for residents: "vibrant" ($F=13.579$, $P\text{-value}=.000$) includes "natural landscape is greater than man-made" ($\text{Beta}=.138$, $t=3.99$, $P\text{-value}=.000$), "a geometric pattern" ($\text{Beta}=.087$, $t=2.583$, $P\text{-value}=.010$), a "landscape with vivid colours" ($\text{Beta}=.097$, $t=2.804$, $P\text{-value}=.004$), "many plants" ($\text{Beta}=.090$, $t=2.463$, $P\text{-value}=.014$), "children's playground and facilities" ($\text{Beta}=.092$, $t=2.67$, $P\text{-value}=.008$) and "exercise facilities" ($\text{Beta}=.075$, $t=2.907$, $P\text{-value}=.036$).

This analysis result indicates that Lush plants, vivid colours, Geometric pattern of landscape design, Facilities suitable for lively activities, such as Children playground and Exercise facilities can improve the feeling of "vibrant".

The diversity of contents which 'vibrancy' includes indicates that the criteria by which people make subjective appraisals are different from those in actual use. Although many residents preferred to see a lively environment which contains many paradoxical aspects, it seems that not many people like to live in this kind of environment, even if some of them prefer the "vibrancy" of the environment and

The second difference is that people often concentrate on design styles which are “simple and practical”, “suitable to the style of the residential buildings” and they dislike a “grand” design style in relation to actual use, while in the general judgment importance, only an “informal” design style would have improved the appraisal levels.

Chapter 10: Main Findings and Conclusions

Maslow said: “Creativity is the capacity to see the possibilities of situations here and now and select, among the choice, the most satisfactory. After an analysis of the potential consequences, to give way to the next situation” (quoted from Sinay, 1998, p.139).

10.1 Prospect or Affordances—the Qualitative Threshold for Actual use

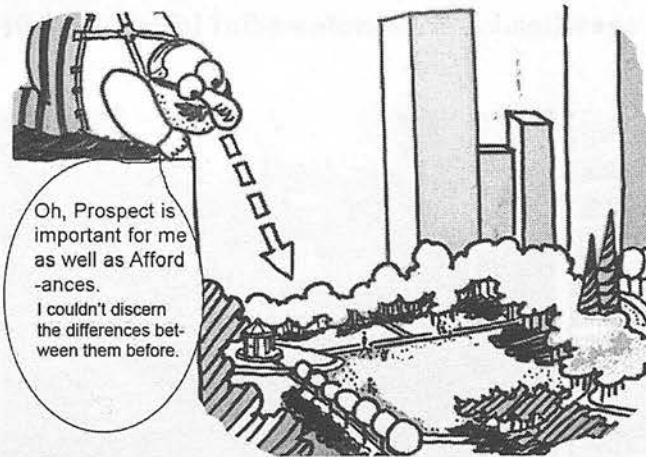


Figure 10-1: Indicators of prospect and affordances are all important for people's actual uses (Source: Fu, 2007)

This part summarises the results from the logistic regression and answer-tree analyses. Predictors from regression analysis give clear ideas about which elements have a significant influence on people's frequency of actual use. Analysis of the answer-tree sequences of these variables is in a hierarchy.

The results indicate that the important levels of the environmental elements on people's actual uses are different. In terms of significant predictors of outdoor environmental use, natural element variables are more important than the variables from the other categories. Compared to the facility and natural element category, the bird's-eye view often has relatively low position in the whole hierarchy (Figure 10-1). This sequence suggests that the influence of the scene on people's actual use is relatively weaker than the influence of the natural elements and facilities.

Given the different contents of the prospect and affordances which were reflected in

the HRFRAs, the indicators of environmental affordances are more important than the prospect indicators which are reflected in the bird's-eye view, in terms of the influence they have on residents' actual uses.

10.2 Information for landscape design of HRFRAs

At different levels - the general level (the three cities) together and at city level, the results of this study can be categorised in three subgroups - the profile of the cities; the preferred environment and significant elements influencing people's use of the environment.

10.2.1 Guidelines for the landscape design of HRFRAs at a general level (in all three cities):

10.2.1.1 Useful Information for the Landscape Design of HRFRAs



Figure 10-2: A waterscape and landform in an informal design style

Top left: A small stream with a natural bank; Top right: the natural landform with flowering shrubs;

Bottom left: A space with highly openness levels;

Bottom right: The natural landscape proportions are greater than the man-made ones;

1. Designers might note that the natural, green appearance of the CCG in an informal design style was popular among HRFRA residents. This was because it offered: a perspective where “the proportion of natural landscape is greater than a man-made landscape”, an environment with plenty of “evergreens” and a waterscape “a stream or a pond”, and the design style is “informal”. Figure 10-2 shows an illustration of these environmental characteristics.



Figure 10-3: Environmental elements which were preferred by high-rise residents.
Top left: Small squares with natural elements; Top right: Pergolas and pavilions;
Bottom left: Vibrant plants; Bottom right: A children’s playground and exercise facilities.



Figure 10-4: The preferred environment for high-rise residents (Source: Fu, 2007)

2. In design practice, natural elements, especially a waterscape, are the most effective predictor of attracting residents to visit the CCG. The next one is the facilities, which must match people’s daily uses. Of these facilities, “exercise facilities” and “small squares” are the two main features. The third aspect is

the appearance of the environment which can improve the environmental aesthetic, although the importance of the bird's-eye view variables are not as important as the other two above for residents in their daily uses (Figure 10-3 and 10-4).

3. In terms of perception and design styles, HRFRA residents like an environment which is “comfortable”. At the same time, it should be “quiet”, “suitable to residential buildings” and “simple and practical”.

“Vibrancy” as an active perception, means different things to different people and includes a sense of “quiet”. The contradiction between the need for a “quiet” environment and a “vibrant” environment is something that designers must address and find a balanced for both qualities in design practice because both factors were preferred by the residents of all three cities.

4. With regard to unpopular aspects of environmental characteristics, designers need to avoid using too many western formal landscape elements, such as big squares and constructions in a geometric pattern. An environment with these characteristics often leads people to think that the environment is lacking in natural landforms and waterscapes, and they are which are often disliked by residents of HRFRA (Figure 10-5).



Figure 10-5: Environmental elements which were disliked by high-rise residents. Luxury gate, big hard-surface square and strong geometric composition of the CCG often get low preference level from high-rise residents.

5. The size of the CCG is important to residents. The minimum size which residents feel is relaxing is $9,000\text{m}^2$. Anything below this size will lead to a feeling of restriction and reduce their inclination to visit an outdoor environment. If the size of the CCG is more than $9,000\text{m}^2$, residents' preference levels increase. Designers can refer to this result to ensure that in future, there is enough area for the CCG.

Designers can check the table listed in the univariate analysis (Section 7.2) to obtain information about the design details that describe the cities' differences. The suitable behaviour settings and profile of the three cities can also provide supplementary information.

6. The demographic characteristics which are reflected in actual use are important factors in landscape design. Designers of the CCG in HRFRAs should refer to the demographic characteristics of the community and the relationship between the environmental characteristics (as reflected in the univariate analysis in Section 7.1 and the predictors of the actual use in Section 9.1).

A summary of these points is as follows:

1) Demographic characteristics reflected in actual use:

- Female residents were more likely to visit the CCG than males. 61% of female were daily users, while only 49% of males were. Male residents were more likely to be less frequent rather than frequent users. The percentage of weekly, monthly, and even seldom users among the male residents was higher than for female residents.
- Length of residence, as a predictor of outdoor environmental use, had a significant influence on residents. The turning point is a year. In the daily user group, the percentage of residents whose residence was longer than a year was higher than for those who had been there for less than a year.

In the infrequent user groups, the percentage of residents whose length of residence was shorter than a year was higher than for those who had been there for longer than a year.

- In terms of occupation, retired and unemployed people made up the main body of daily users. Compared to the retired and unemployed residents, the percentage of daily users among the students, part-time and full-time job residents was lower.

Of the less frequent user groups, especially weekly user groups, the percentage of employed residents was higher than for other occupational groups. Although people aspired to engage with the natural environment, work and study took up most of the time and reduced their possibility of doing so.

In relation to the monthly users, education and occupation were significant co-related

factors. 85% of the monthly users with a bachelor or masters degree were in a full-time job. Though they visited the outdoor environment infrequently, these residents aspired to do so and their attitude to some of the physical attributes was similar with that of the daily users.

- The other demographic characteristic is the influence of childhood frequency of use of the outdoor environment. People often keep the habits as adults that they formed in childhood. The percentage is quite high. 65% of childhood daily users will visit an outdoor environment on a daily basis as adults. Conversely, 45% of people who were rarely users in childhood will keep to that habit after they grow up.

2) Besides these demographic characteristics which were reflected in actual use, some were important for the identification of environmental preferences. There are four demographic variables which designers should address:

In different age groups, the purpose of visiting the CCG might be different. Elderly residents visited the CCG for relaxation purposes. Thus they preferred a quiet environment and liked to take some exercise or go for a walk, while young and middle-age people liked to look after children.

Education is a variable which has an influence on many aspects. The main differences existed between groups which had university educational attainment levels, and groups with poor educational attainment levels. Residents with high educational attainment levels preferred to visit the CCG alone. Natural elements, with informal, simple and practical design styles were their preference. Compared to poorer-educated residents, the highly-educated residents were more likely to show a preference for a quiet environment. Although education was not a significant predictor of actual use, it did affect the preference level in response to the activities, physical attributes and design styles of the environment, therefore, educational attainment levels are an indirect predictor.

The other two important demographic variables are occupation and childhood frequency of use of an outdoor environment. Both are significant predictors of actual use.

In different occupational groups, employed residents had different attitudes to

environmental characteristics compared to unemployed people. Employed residents are more likely to visit the CCG to accompany children rather than to go for a walk, which was the activity preferred by unemployed residents. Employed residents often held negative attitudes to informal, simple and practical design styles. This difference reflected the fact that employed residents visited the CCG with a clear purpose of looking after children.

Childhood frequency of use of an outdoor environment had a significant influence on people's social activities but did not affect their preference for other environmental characteristics. Frequent users of an outdoor environment in childhood preferred to visit the CCG as an adult to meet friends, join in some activities and to accompany children.

10.2.1.2 Factors which landscape architects might pay attention to

1. The difference between the judgment importance level and actual use.

The results of the author's study also revealed that residents emphasised different aspects of the environment in terms of the judgment importance and actual use of the CCG. Residents' general judgment importance puts the focus on the functional aspects of the CCG. They cared about vehicle usage, size (which I can walk around in 30 minutes) and children's playing facilities rather than the perspective from on high and natural elements such as landforms and waterscapes, which were significant for actual use. The judgment importance of the CCG also revealed the merits of a 'vibrant' atmosphere which had a positive influence on people as well as an informal design style.

These differences might be for many reasons but they reflected that in different situations, residents applied different criteria. Sometimes, they might give a high mark to an environment which they might not like to visit in real life. The alleged preferences which the residents insisted should be screened out had to be balanced by significant predictors of actual use.

2. 'Vibrancy' and how it can be accommodated in a quiet environment.

The results of the author's study suggested that residents of HRGRAs preferred a

green and quiet environment in an informal design style. A variety of plants, evergreens, and a natural perspective were considered as the characteristics of a 'comfortable' environment. Facilities such as pergolas and pavilions, and exercise facilities were also important environmental elements for people's satisfaction. Vibrancy was another important aspect of 'comfort', although the preference level for 'vibrant' was not as high as the preference level for 'quiet'. The choice of 'vibrant' did reflect residents' multiple preferences for nearby environments.

However, the vibrant comfort environment contained some features such as vivid colours and geometric patterns, which might reduce people's frequency of use. The difference in the two environmental characteristics on people's use reflects an issue with which landscape architects need to engage. The 'vibrancy' of the CCG should be controlled under the general atmosphere of 'quietness'. Compared to 'vibrancy', quietness was more important for high-rise residents. Designers of the CCG in HRFRAs need to balance these two aspects if they wish to improve the quality of design in terms of actual use and to satisfy subjective evaluations.

3. The importance of the perspective of the CCG

Predictors, and their importance in relation to actual use, indicated that the influence of affordances indicators was greater than that of prospects on people's use. A high quality design should pay attention to both aspects. Although frequent users visit the CCG for different purpose, the point is that all of them regard the perspective of the CCG as an important aspect, after the natural elements or facilities. This result showed that the prospect indicator was an indispensable one for high-rise residents, although its effect was weaker than affordances.

10.2.2 Guidelines for the landscape design of HRFRAs at city level

The three cities were profiled according to the attitudes to the CCGs to allow for an overall, general analysis to be presented to designers. In addition, the preference details and the significant predictors of actual use have contributed to design principles to which landscape architects might refer.

10.2.2.1 Profiles of the Three Cities:

- 1). Beijing is a metropolitan city whose residents, on average, have high-educational attainment levels. They prefer a simple and practical lifestyle and a quiet and natural environment. They also prefer to undertake some personal activities in the CCG, such as “to go for a walk” and “to approach a natural environment”;
- 2). Shenzhen is a typical young city, which has a fast pace of life (the highest percentage of full-time job respondents). Social ties between residents are weak. A “comfortable” environment was often paid more attention by Shenzhen residents than Beijing and Hangzhou residents. Because of the high density of population (the plot ratio in Huangting Garden is 2.6), people paid great attention to the size of the environment and disliked “a place you can walk around in 7 minutes”.
3. Hangzhou, as the oldest city (the average age of the respondents is the oldest of the three cities) has the highest average number of family members. People’s attitudes to life were more active than Beijing and Shenzhen. They were more accommodating of some unpopular activities such as “to walk dogs” and their attitudes to the environmental characteristics were evenly spread and not as strong as for the other two cities. The social ties between residents, however, were relatively strong.

10.2.2.2 Design details of the three cities

The author’s individual profiles of Beijing, Hangzhou and Shenzhen provided a general impression of each city. The analyses also revealed the detailed differences which each city’s residents preferred. These differences are as follows:

In Shenzhen, residents pay attention to the design of the CCG in terms of the colour of the environmental elements and the density of the plants. Compared to Beijing and Hangzhou, Shenzhen residents’ use of the CCG is influenced by visual perspectives more than the actual facilities which people use every day. Landscape architects should consider the visual effects of the CCG as a first priority. The greatest preference was for a spacious environment with a low plant density in this city. Of the facilities, a children’s playground was the most popular.

In Hangzhou, the design of the CCG requires landscape designers to pay more attention to the details of the environment. The number of predictors of actual use was greater than in Beijing and Shenzhen. This reflects the fact that Hangzhou residents have a clear idea and have expectations of a higher quality nearby environment than Beijing and Shenzhen residents. Landscape architects who design the CCG in this city should pay attention to the natural landforms and multipurpose small sites, and establish simple and informal design styles in a quiet atmosphere.

Designers of CCGs in Beijing need to consider the influence which the geographical location has on people and the environment. A low temperature might influence residents' environmental preference and actual use, it also leads to a monotonous colour in this city such that residents prefer to see more evergreens in their nearby environment. In addition, exercise facilities are important for people's daily use.

Summary:

This chapter summarises the results of the analyses in the previous chapters. Of these results, the comparisons between the influences of prospect indicator and affordances indicators suggest that the detailed functional elements are more important than those perspectives on people's actual use of the outdoor environment. However, beautiful scenes which are reflected in the aerial perspectives correlate to people's daily use intensely and reinforce the effect of the affordances indicators.

With respect to the design details, people prefer waterscapes and natural landforms in the CCG, and like to visit an environment which is green (with many plants), quiet and designed in an informal style. Because the locations and styles of each city are different, people's frequency of use of the CCG and their attitudes in response to the environment are different.

Beijing is a big city in the north of China. Its residents showed a preference for evergreens and they like to undertake some social activities in their daily life.

Hangzhou, as the oldest city, maintains high environmental standards. Residents of Hangzhou like social activities and their attitudes towards the environmental

elements are even, compared to Beijing and Shenzhen residents.

Shenzhen is the newest of the three cities. Residents of Shenzhen do not like social activities as much as Beijing and Hangzhou residents.

However, all residents in the three cities showed a preference for the density of plants and the colours of the composition in bird's-eye view, influences the actual use of Shenzhen residents more than Beijing and Hangzhou residents.

Other characteristics, such as the demographic differences in relation to environmental preference and actual use can be found in the summaries for each section.

Chapter 11: Discussions and Implications for Future Study

Landscape architects should have a social conscience, and their work should improve the quality of life and minimise crime. The future of design needs to harmonise the relationship between the aesthetic, social needs and the environment (Thompson, 2000, p.178). The issues which designers need to consider in design practice are so extensive that the deficiency of any one aspect may reduce the overall design quality.

A public place needs to satisfy most users if it is to meet the requirement of its being a socially useful place. The results of this study indicate that some problems exist. Although some are beyond the capacity of this research, these problems should be addressed in future landscape design studies.

11.1 Implications for Future Study

11.1.1 The Conflict between Multiple Uses and the Narrow Space of the Outdoor Environment in HRFRAs

A problem reflected in this study has been the conflict between multiple uses of the CCG environment and the narrow (in terms of the population density) outdoor environment of the HRFRAs.

This conflict is expressed in terms of the ideal size of the CCG which residents said they would prefer. Although the ideal size was one which they could “walk around in 30 minutes”, it is difficult to reach this criterion, even the minimum 9,000 m² (resulted from the variable “the CCG which I can walk around in 15 minutes”) had to satisfy people’s actual use in this study.

In most HRFRAs, there is a 30% preserved area for landscape, including a buffer zone around the residential buildings. If the area of the whole HRFRA is smaller than 45,000m², it will be really difficult to reach this criterion.

Secondly, from the point of view of actual use, multiple uses of the environment, which were reflected in the different activities, need different behaviour settings. Some personal activities such as “to go for a walk” need a quiet environment in an informal design style. On the other hand, the suitable behaviour setting for the activity “to meet friends” is vibrant with “vivid colours” and relevant facilities (Section 9.4).

People who took part in these kinds of social interactions did not pay as much attention to the perceptual aspects of the environment as those residents did who preferred personal activities such as “to go for a walk”. Thus the juxtaposition of these different activities in a narrow environment could put the participants in different activities/events into conflict.

Thirdly, the demographic background of users influenced which activities they were likely to participate in. From the activities which residents preferred, designers can see that employed and highly-educated residents preferred to undertake some personal activities for relaxation purposes. While retired and unemployed residents with poor educational attainment levels were more likely to join in some social interactions in the CCG. Age and gender had the same influence on these activities.

In most situations, it is easy to satisfy a particular need in a single functional environment. However, the downside is that the clear functional role that an environment has might preclude some activities from taking place which might bring vibrancy to that environment. On the other hand, in the long term, an environment that lacks users and surveillance might cause many social problems. The demolition of the Pruitt-Igoe high-rise flats is an example. Newman (1973) talked about this problem as well.

The multiple uses of an environment often puzzle researchers and leads them to conclude that “enjoyable environments may not be completely planned out” (Nasar, 1994, quoted from Cross and Kler, 2004).

This opinion suggests that users often use an environment to suit their own needs rather than in response to what the designer may have envisaged as being desirable. However, in the CCG, occasional activities can increase the vibrancy of and the accommodation to the environment, which can make users feel comfortable. This

means that the places that satisfy several needs can satisfy people more than places in which possible activities are narrowly defined (Stokol 1979, quoted in Stokol and Schumaker, 1981).

In this point of view, it would be necessary then for designers to acknowledge what activities could be put together on-site, the degree to which these activities could accommodate each other and how they could be put together in a way that would satisfy residents' needs.

11.1.2 The Reason for the Decrease of Actual uses among Middle-aged Residents

In design practice, human-centred design of a public space involves the understanding of a guided search for a set of interventions in an ongoing environment that will best produce and maintain a socially useful place (Carr, 1992, p.250). A good environment often means people can find places suitable for their needs.

In the CCG of the HRFRAs, the shortage of space is often presented as a result of the occupancy of that space by particular groups, while others are excluded.

The results of this investigation indicate that different demographic subgroups have different requirements of an outdoor environment. Some needs of a demographic group are in conflict with others. This might lead to a situation where some residents pursue their relaxation in other places, away from their nearby outdoor environment (Newman, 1972), because middle class users defined a place in terms of its having a sense of belonging which can be marked out by a clear boundary and order, which

would rule out its use by others, while lower-income groups' feeling of place or belonging was determined by the familiarity of the place itself and the people in or around the place (Lee, 1972). These studies indicated that

Distribution of different income groups among the respondents

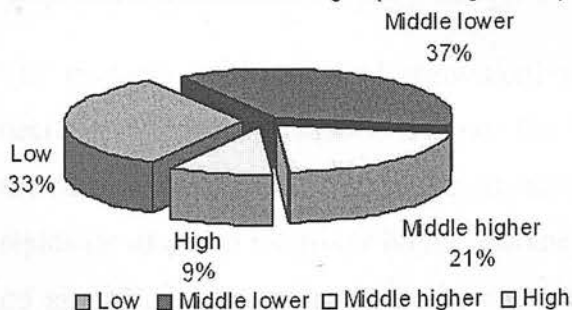


Chart 11-1

income levels might be an important indicator of actual use of the HRFRAs.

Distribution of the income level among different age groups

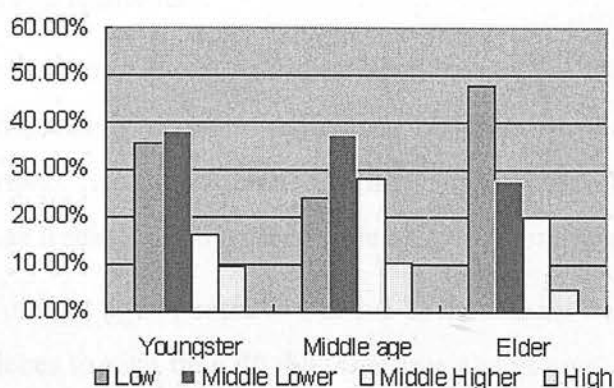


Chart 11-2

number of young respondents in each group was greater than for the middle-aged residents (Chart 11-2). At the same time, the income differences between the age groups reached significant levels (Chi-square=19.8, P-value=.000).

Distribution of the users in different age and income groups

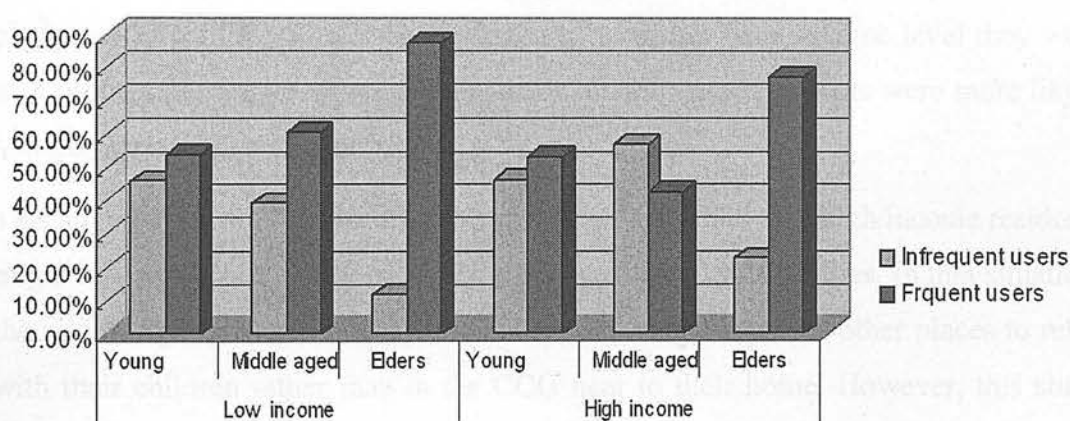


Chart 11-3

The in-depth (multi-nominal regression) analysis found that the frequency of use decreases with an increase in income. The higher that the income level was, the less the residents visited the CCG. This situation arose among the middle-aged and older residents who had relatively higher income levels (Chart 11-3). However, there was no significant change in the percentage of daily users among the young residents with different income levels. The ratio of infrequent users vs frequent users in the young residents was 1/1.16 in the low-income group. In the high-income group, this

Of the high-rise residents, middle lower and low-income residents made up 70% of all the respondents. Although the percentages of middle higher or high income level respondents among the middle-aged residents were higher than for the younger people (Chart 11-1), the

ratio was 1/1.15. The decrease in the average frequency of use among high income residents could be mainly attributed to the middle-aged and older people rather than young residents.

It is interesting to speculate what caused the decrease in the frequency of use with which high income middle-aged residents visited the CCG. Was it as a result of the greater number of choices which high income levels brought to these residents, or was it related to the ideas which high-income residents had about the environment?

Younger aged people are active in their daily lives. They often have more choices or places to visit than do the other two age groups. This situation may influence the use of the outdoor environment. What do the equal ratios for the two income groups reflect?

Child-caring might be a reason for the difference between middle-aged and younger-aged residents. Many younger aged and middle-age residents need to look after children in their spare time. The univariate analysis results (Section 7.1) showed that middle aged, high income residents paid more attention to the children's playground than the younger-aged residents, no matter what income level they were in. Compared to the younger-aged residents, middle-aged residents were more likely to accompany children in the CCG.

This situation shows that the decrease of use in the middle age, high income residents might be a result of the lack of children's playgrounds and facilities. In that situation, the middle-age residents who have more money, might look for other places to relax with their children rather than in the CCG near to their home. However, this study cannot explain why younger-aged residents stick to the CCG in both low and high income groups. A further study on what causes this difference needs to be carried, with respect to how the two age groups use the CCG for child-caring and why they do that.

11.1.3 Awareness of Health or Improvements of the Environment: Reasons for the Increase in Frequency of Use

The correlation between childhood outdoor environmental use and how this correlates with residents' actual use in adulthood has been examined by Ward

Thompson and Aspinall (2004).

The author's study of the CCGs in HRFRAs has confirmed this opinion. A high quality outdoor environment attracts people to use it frequently. There is a phenomenon whereby frequent users of the CCG often accompany children to an outdoor environment, consequently, the children will establish a healthy lifestyle that they will continue into adulthood, thus creating a long-term effect. In this study, residents who had often visited an outdoor environment in childhood were more likely to visit the CCG with their own children (Section 7.1). This result shows how this habit of visiting an outdoor environment may be passed on, generation by generation but it does not explain the reason for the increase in the frequency of use and why less frequent users in childhood visit an outdoor environment frequently as adults (Section 9.4). A future study could investigate the point further to try to establish what causes this: is it due to an improvement in the physical environment or is it due to an individual's awareness of his/her health, or both reasons?

Addressing these questions might lead designers to change their attitude to aspects of design practice. China's economic development has made its population pay more attention to the health problems which have been caused by the environment than twenty years ago. Landscape design needs to keep up with this change not only as a macro study such as an ecological study but as a micro study – of the individuals who are affected by these changes.

11.1.4 The Balance that Needs to be Found between a Contemporary and Conservative Landscape Design Style

This is a topic which might prompt many arguments. In design practice, designers often hesitate about what style they should adopt for a project. Because of the lack of first-hand data, designers' personal preferences and real-estate developers' opinions become crucial in deciding what should be adopted in China.

Lawson (2001, p.195) pointed out that there are three design strategies - "procrastination", "non-committal design" and "throw-away design". Designers and decision-makers prefer the first above the other two. The non-committal design often gets criticised that the place lacks meaning and character. A "throw-away" design means that something is currently fashionable, while it may be out of date in the near

future; the “throw-away” design seems increasingly popular.

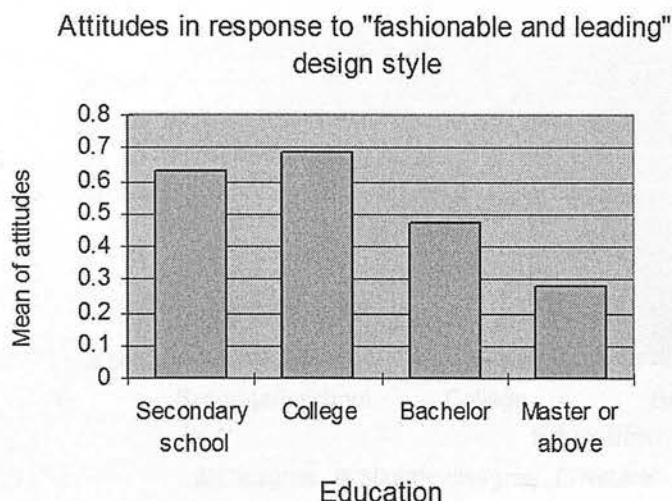


Chart 11-4

However, the author’s analysis of the opposite design style, “fashionable and leading”, found that it was not as popular among highly educated residents as it was among more poorly-educated residents (Chi-square=18.6, P-value=.000) (Section 7.1) (Chart 11-4).

Proportion of the attitudes in response to “fashionable and leading” design style

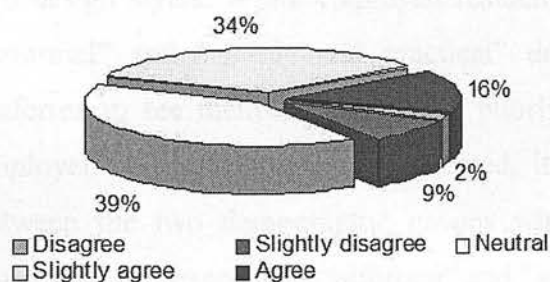


Chart 11-5

groups, the percentage who preferred “fashionable and leading” was greater than those holding opposite views (Chart 11-6).

Thus, the problem becomes how to establish a fashionable and leading environment or in other words, how do you bring into harmony the relationship between contemporary and conservative design styles in a way that is acceptable to HRFRA residents?

The statistical results show that the HRFRA residents prefer an environmental design that is “non-committal” (Section: 6.1.3). An informal, green environment, which can meet people’s needs, simply, such as offering rest, exercise and child-caring activities, is good for people’s daily use.

In this situation, a designer still needs to consider the fact that a fashionable and leading design style was preferred by 50% of the total number of residents. Only 11% of the residents disliked this design style (Chart 11-5). Even in the highly educated resident

Distribution of the attitudes in response to the "fashionable and leading" design style in different educational attainment level groups

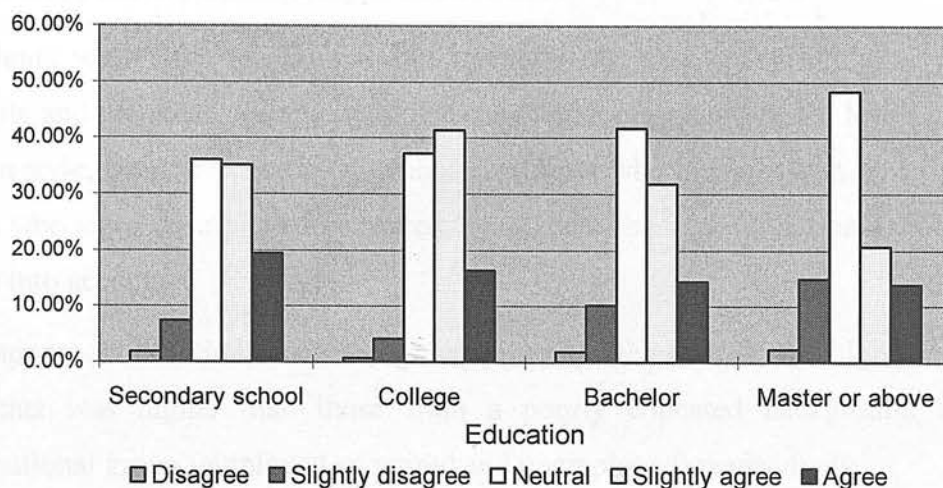


Chart 11-6

11.1.5 The Refinement of the Design Styles

People had different attitudes to the design styles - "simple and practical" and "informal".

The results of the univariate analysis (Section 7.1) showed that residents from different educational and occupational backgrounds held different attitudes to the two design styles. While employed residents showed low preference levels for the "informal" and "simple and practical" design styles, highly educated residents preferred to see them more than the poorly educated residents. Since most of the employed residents are highly educated, it is difficult to identify the relationship between the two demographic groups when both education and occupation are considered, in response to "informal" and "simple and practical" design styles.

The partial correlations between the design styles and one of the demographic variables were checked by the author, while the other demographic variable was controlled. The results showed that both demographic variables can reinforce the correlation of one with the other in relation to the design styles (Appendix 11-1, 11-2, 11-3).

In this situation, age does not influence people's attitudes to these two design styles. If both occupation and education were controlled, the correlation between the two design styles and age (which has a significant correlation with occupation and

education) would not be significant.

1) The logistic regression analysis showed that:

Residents with high educational attainment levels were more likely to prefer a “simple and practical” design style than those with poor educational levels. For this design style, the preference level of those residents who had jobs was lower than for those who were unemployed or retired, even when the educational background was taken into account.

In response to the “informal” design style, the preferences of the highly educated residents was higher than those from a poorly educated background in each occupational group (employed vs retired and unemployed) respectively.

Compared to retired and unemployed residents, the preference level of employed residents was lower than for those without jobs.

2) The result of the multi-nominal regression analysis showed that:

Residents who had jobs showed lower preference levels for “informal” and “simple and practical” design styles in general, compared to those who were retired or unemployed. This tendency considered the influence of residents’ educational background.

In each occupational group (employed and unemployed), residents from a highly educated background showed higher preference levels than those from a poor-educational background.

This difference is very obvious among poorly educated residents who have jobs. In these cases, the ratio of residents who disliked the “simple and practical” design style compared with those who preferred this design style was 4/1, while for the highly educated employed group, the ratio was 2/1. In response to the “informal” design style, the ratio (dislike vs like) in both poorly and highly educated employed residents was about 2/1 respectively (Chart 11-7).

This distribution indicates that among employed residents, poorly educated residents are more likely to have negative attitudes to the “simple and practical” design style than those who are highly educated. By contrast, this response by the employed poorly educated and highly educated residents to “informal” was not as obvious as it

was in their response to “simple and practical”.

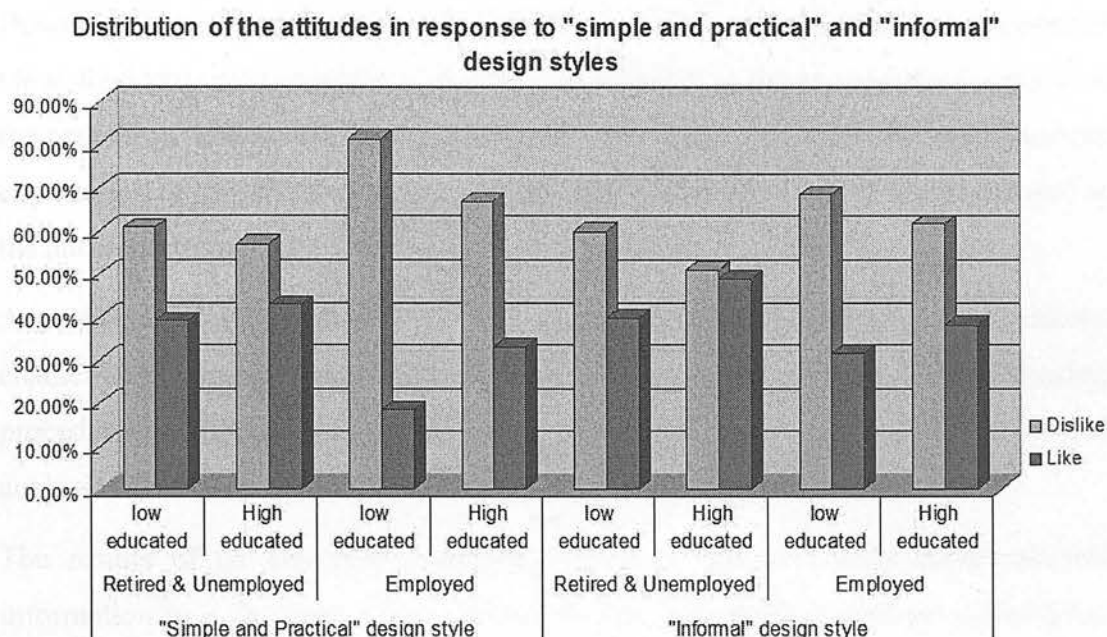


Chart 11-7

This situation implies that a “simple and practical” level, which is suitable to different employed educational groups, is worthy of discussion, when considering their needs and aesthetic preferences.

11.2 Discussion:

11.2.1 The Order of the Environmental Elements which Influence Residents' Decision-making

The hierarchy of the physical attributes in response to actual use identified that the first discriminator was the waterscape from the natural elements category, then the facilities and bird's-eye view of the CCG. This sequence was different from what Appleton (1996) had proposed.

In ordinary life, how a person behaves in an environment depends on the information that they draw, firstly, from the view. This means that an individual assesses an environment before he/she takes action. This habit can be suggested by the fact that many people say that: “before I get into a new place, for example, in front of a city square, I will see how many people are there. If the number is small and the scene is

not good enough, I will leave” (Liu, 2007, personal information).

However, the order of the physical attributes in this investigation showed an opposite view. Residents paid attention to the detailed elements in the environment rather than the panorama. The reason for this difference between the investigation result, and the explanation of the activities people usually take might be the tool that was adopted in the author’s study.

Answer-tree analysis optimises the match between external environmental characteristics and different users rather than analysing the inherent decision-making procedures which people usually take. Therefore, the result of an answer-tree analysis cannot explain internal personal decision-making processes.

The results of an answer-tree analysis, however, can still offer some valuable information to a designer. This is somehow like “unconscious and yet controllable behaviour which might seem at first an impossible paradox, but it is not” (Lawson, 2001, p.16).

When we learn music, once we master it, we are also likely to play it well without too much conscious attention. In a POE environment, people are familiar with environments and use outdoor environments frequently, as a habit, thus their behaviour when visiting a CCG is more or less subconscious. People do not need to observe the whole environment totally, as a stranger would do, to avoid the latent hazards and to use the environment purposefully.

In this situation, indicators of environmental affordances are more important than those for aesthetic purposes, and the result is expressed as one where the natural elements and facilities are more important than the aesthetic pleasures, although they are indispensable in the daily life of the residents of the HRFRA.

11.2.2 Can a Nature-dominant Environment Increase Actual use of the CCG?

There is one finding from this study which might be different from the Kaplans (1989). Can the CCG offer mystery to residents or, can an ‘interesting’ environment obtain high preference levels among the residents and attract them to increase their frequency of use of the environment?

Kaplan and Kaplan (1989, p.60) claimed that mystery and coherence seemed to be

important factors in explaining patterns of preference in a natural environment. The nature-dominant environment with these characteristics will attract people to explore it.

The results of the author's investigation into residents' opinions offer some differences. The preference level for the "interesting" perception is lower than for the other three perceptual variables (Section 6.2). Although residents showed positive attitudes to this perception, it did not have a significant influence on residents' frequency of use of the outdoor environment.

On the other hand, the bird's-eye view variable, "I'd like to see from my window that the CCG looks like a forest" gained a high preference level in this study. However, the effects of the two environmental characteristics on residents' actual use were negative, especially in Hangzhou and Shenzhen (Sections 9.3.2.2 and section 9.3.2.3).

One possible reason is that the dense forest, which presents mystery, somehow conceals latent dangers so that there is a decrease in the frequency of use of the outdoor environment. Infrequent users liked the scene with this environmental characteristic, but for frequent users, they often chose a spatial configuration with highly open levels (such as "a big lawn with some tall trees") and relevant facilities.

The other reason for this difference might arise from the different context in which the CCG is located. This result should be considered cautiously, given the familiarity respondents have with the environment. In an urban environment, people prefer it to have few uncertainties. An environment with many natural elements that screens a view implies uncertainty or even danger for people, thus frequency of use may decrease for this reason.

Summary:

This chapter explored the problems that arose in the course of this study.

The first problem was the conflict between the multiple uses and the narrow space of the CCG. Given the actual situation of the HRFRAs, it is difficult to satisfy the

criterion that the size of the CCG should be greater than 9,000m² which is what would satisfy most residents. The way to resolve this is to explore the feasibility of putting together some activities which are similar.

The univariate analysis results show that “to do exercises”, “to go for a walk”, “to accompany children” and “to approach a natural environment” in the CCG are the four activities which get significant different responses from the demographic groups. Although the backgrounds of the residents who prefer these activities are different, the compatibility of these activities can be explored among the residents in different gender, age, occupation and education groups.

The second problem was the decrease in use of the CCG among middle-aged, high income residents. The difference in frequency of use might be as a result of the lack of children’s playgrounds and facilities. Child-caring requirements might lead middle-aged, high income residents to look for other places where it is suitable for their children to play, however, these reasons cannot explain why younger-aged residents stick to the outdoor environment close to their homes. There is no evidence to show that the younger-aged residents do so because of their preference for child-caring activities, or for facilities such as a children’s playground.

The other problems that arose were in terms of the design style of the environment. Retired and unemployed residents wanted the environment to be “simple and practical” and “informal” more than those residents who were employed. Among the occupational groups, highly educated people were more likely to show positive attitudes to “simple and practical” and “informal” than those who had low educational attainment levels. The same situation applied to the responses to “fashionable and leading” design styles. Designers of the HRFRAs should think about what point is acceptable for both sides in relation to the design styles.

Final Messages: Information for the landscape design of HRFRA

Many designers think undertaking design of CCGs is easy because of the small size of the garden, compared to large area urban parks and restoration districts. For them, the CCG is much too small to be given serious attention. However, the starting point of this thesis indicated that the CCG of the HRFRA is an intimate environment and relevant to people's everyday life, and it has an influence on people's behaviours including their relaxation activities. In the situation of the rapid economic development of China, detailed studies of its potential will improve people's living conditions and quality of life.

In the author's study, preference provides the context for the investigation. It is suitable for the study of the CCG of HRFRA because of the nature of preference and the exact situation of the HRFRA. Compared to physiological needs, preference can operate across Maslow's hierarchy and influence people's behaviour and choice in many situations. "In addition to Darwinian survival-value, we may now also postulate "growth-values." Not only is it good to survive, but it is also good (preferred, chosen, good-for-the-organism) for the person to grow toward full humanness, toward actualisation of his potentialities, toward greater happiness, serenity, peak experiences, toward transcendence, toward richer and more accurate cognition of reality, etc." (Maslow, 1970, p.104).

Although the effect of preference on behaviour may not be presented as strongly as physiological needs in most situations, it belongs to the same category of motivation. Beck (1990, p. 29) stated that preference is considered as the index of motivation and believed that the connection between preference and motivation was based on needs. In this situation, preference can work as a useful context to study both the functional and the aesthetic effects of the environment as a result of people's needs.

Many outdoor environmental researchers have applied it in their studies and obtained supporting results, such as Kaplan (1977, 1989), Ward Thompson et al (2004),

Hartig (2006) and Clark and Uzzells (2002), etc. Compared to the direct effect of the outdoor environment on people's relaxation, preference can satisfy a higher level of needs when the establishment of the physical environment becomes a common feature in the HRFRAs.

The author underpinned his investigation in environmental psychological theories, and taking that approach, he obtained a general description of residents' environmental preferences which influenced their actual use of the CCG in Beijing, Shengzhen and Hangzhou.

His study also suggested that the relationship between people's preferences and behaviour was a transactional one and that experience played an important role in this interaction, for example, frequency of use in childhood of an outdoor environment had a bearing on adult frequency of use of the CCG.

Additionally, the author referred to place theory, environmental affordances, prospect-refuge, behaviour settings and personal construct theory, to establish a theoretical framework for this study and one which connected residents' perception of the environment to actual use.

The theoretical framework of this thesis was built around the context of HRFRAs through a connection between the perception and design of the outdoor environment. The structural sequence of the study moves from a general understanding of the environment to a context-specific design aim.

Of the four theories which composed the overall framework, place theory and behaviour setting theory are two general ones for the study of the HRFRAs. Although there are many aspects of the contents which overlap in the two theories, they have different focuses. For example, behaviour setting theory highlights the suitability between the activity and the environment, and stresses the role of behaviour as a starting point. On the other hand, place theory provides a more general classification and integrates a framework of relationships between all three categories (activity, physical attributes and concept of the environment). The study of the HRFRAs uses the general classifications of place theory to provide an understanding of the whole environmental contents rather than the classification of the social milieu and the physical environment in behaviour settings.

Of the four theories, prospect-refuge and environmental affordances theories provide the detailed categories for the study, based on the structure which place theory and behaviour settings theory offer. The PCA results suggested the correctness of the taxonomy of the physical environmental attributes in this study as the detailed categories of each place were found to be relatively independent. Of these categories, the information which residents got at a high level (panorama) was different from the details they got at eye-level, and the aesthetic of the design style is different in terms of their feelings about the environment.

The effect of prospect-refuge theory is that it not only details the content of the environment but also offers a simple system to clarify a complex environment. There are two points worth mentioning for landscape architects. The first one is the feeling - to see or to escape, which works as the result of the aesthetic of the environment. The level of hazard works as an index which evaluates the contents of an environment. As a result, landscape architects can evaluate the quality of design in a simple way, reflecting on how users of these environments express their feelings about an environment via personal preference.

The second point highlights the connection/effect between the impression of the whole site and people's behaviours. Prospect-refuge theory undertakes its evaluation of environmental safety, based on the panorama. Evaluation of the whole environment is essential for people to draw a conclusion about the final decision - to "see" or to "escape". This is not only effective in the natural landscape but also in an urban environment where people can overlook or see far from where they are. The result of this study shows that the panorama is independent of other environmental categories and influence on the behaviour of HRFRAs' residents, especially those scenes with a natural appearance and in an informal design style. This result also indicates that the aesthetic effect of perspectives and the composition of the panorama are important and independent aspects which influence people's behaviour.

However, prospect-refuge theory, as a static appraisal of the natural environment focuses on the meaning of a single environmental element, shows to people rather than the composition of the whole site. In design practice, it would be better if this

theory could give more explanation about how to analyse the pattern in a general and simple way. Landscape architects who design HRFRAs' outdoor environments might refer to other theories and studies to make some modifications. And this is what the result might lead to in the future.

Environmental affordance theory analyses the relationship between the environment and behaviour from a functional angle. It also provides a possible explanation for the impact of aesthetic influence on people's behaviours for relaxation purposes, as a function of the environment. This idea further provides a chance to explore the juxtaposition of the aerial perspective and detailed environmental elements in some particular situation. With the different positions of the observers in mind, the effect of the high-level perspective and the eye-level details of the environment are compared in the context-specific environment (the position of the observer is regarded as a point inside the space and the observer thus becomes a participant of the space rather than the observer who stands outside the environment as an onlooker).

However, the relationships between the possible functions of the environment and likely behaviour are complex. One of the complexities can be described as the overlap of environmental details, which are suitable for a behaviour/activity, are also preferred by other activities. The overlap of the preferred environmental elements from different activities indicates that designers of HRFRAs' outdoor environments might carry out some studies on the flexibility of the environment for those activities which require similar environments and how they can be juxtaposed, so as to resolve the problems of restricted availability of space.

The second complexity is the effect of "motion perspectives" (Gibson, 1979, p.112), which observers get in the locomotion process and making an assessment of the impact this might have for design purposes. As far as the general impression that the whole environment gives to people is concerned, the detailed functional aspects might not be enough to answer the question. Gibson (1979, p. 222) stressed that "the persistence of the environment together with the coexistence of its parts and the concurrence of its events are all perceived together". The whole perspective is different with the stimulus of the environmental element, particularly. Although

environmental affordances (Gibson, 1979) highlighted the effect of layout and the edge of objects on the visual information people obtained in the process of movement, Gibson did not mention the relationships between the whole and the parts. This might leave a series of questions for landscape architects.

With respect to the landscape architects of HRFRAs, the impression of the panorama from a high-level can be compared with the impression of the co-existence of motion perspectives at eye-level - the impression of the consecutive scenes at different points of the locomotion. The result of this comparison might influence people's cognition of the layout of the CCG and the effect of the perspective from different levels, so as to improve the quality of design for aesthetic purposes, or even the way-finding in the CCG, and further, to influence people's behaviour as "approach or avoid".

With all these factors in mind, there are three points which might be mentioned again in the study of the CCG in HRFRAs:

Firstly, the application of place theory and behaviour setting theory need to be detailed by other theories.

Secondly, people's reactions to an outdoor environment are expressed in a variety of ways. Preference, as a general motivation, influences people's behaviours, and is also linked to the possible reactions "to see" or "to escape", in some situations. Landscape architects might refer to this effect on people's behaviours when they study the quality of environmental design.

The third issue is the composition which works as the language of the designer in the landscape design study. The language of designers might be expressed as the pattern which integrates environmental details in a general way. Bell (1997, 1998) talked about the patterns of the landscape and the way these patterns work together as being a reasonable explanation and useful for researchers to refer to in their study. Through using the pattern language of designers, researchers can explore the effects of the environment on people's behaviour in an easier and understandable way in the environmental design of the CCGs of HRFRAs.

On the other hand, the design of the CCG in the HRFRAs is not only a physical

construction, but also a psychological construction. As a transactional process, users' actual use and appraisals worked as the criteria to evaluate the quality of design. Designers need to stop imposing their own taste and instead, must assess user preferences and avoid making naive assumptions about the users (Im, 1984). To design and construct a high-quality outdoor environment in HRFRAs, residents should be the centre of the study with the support of environmental psychology.

The attitudes to these different place characteristics indicated a general issue, that is, how to scope and understand the problems which must then be reflected in an improvement to the overall design quality of the CCGs. However, the relationships between the environmental characteristics and users in the HRFRAs showed that education and occupation are two important demographic variables which have a significant bearing on these problems. The influence of age, income and number of family members are relatively weak, compared to education and occupation. This finding shows that the residents who have different occupations and educational attainment levels might be critical in terms of future outdoor environmental design of CCGs in HRFRAs.

The frequency of use in childhood often correlated to the use of the CCG in adulthood. Residents with a high frequency of outdoor environmental use in childhood were likely to visit the CCG as adults and preferred to take their children to an outdoor environment.

In Chinese HRFRAs, most residents are middle class, but some rich people also live in these areas. This is one key difference between Chinese and European countries.

Of the middle-class residents in the HRFRAs, many of them are from rural areas. Although they lived previously in a rural area when they were young, the time they spent in an outdoor environment was for leisure purposes. The new Chinese middle class, however, attend primary then secondary school, then go onto university and into offices and do not have direct experience of life as a peasant. In terms of poorer urban migrants, many have not been to university, they are often on a low salary and cannot afford to buy a flat in the city.

At the macro-level, the construction of high-rise flats was initiated by the Chinese government to address the shortage of arable land and control the extension of urban

areas, and such construction works are seen as a long-term policy. This means that most Chinese people will live in this kind of building in the future. People's childhood experiences will influence their adult behaviour and will have an effect on this kind of environment.

The distribution of adults' frequency of use of the CCG in different groups for childhood frequency of use of the outdoor environment showed that many infrequent users of the outdoor environment in childhood visited the CCG frequently. Although the reason for this increase is unclear, health concerns might be an important factor here. The reasons for their health awareness might be due their average educational attainment levels and work-related stress.

Consideration of health awareness is significant for landscape design in China. This would require a shift of thinking for Chinese landscape architects. In Chinese traditional garden design, aesthetics are often top of the list of design principles. This leads to an overemphasis on landscape aesthetics in design practice. Health awareness is an important reason for Chinese landscape architects to treat aesthetics and the actual effect of it appropriately. Designers should regard aesthetics as design factors which can be made relevant to health, rather than as an abstract which is difficult for most ordinary users to understand.

The last issue which the author of this study might mention is the number of dog owners. In this study, people showed negative attitudes to "walking dogs" in the CCGs. The activity "to walk dogs" also decreased people's frequency of use in the outdoor environment. Although this result showed a general idea about and in what way this activity had an effect on people's actual behaviours, this research did not distinguish the attitudes of dog owners and non-dog owners. According to the information of the Xinhua News Agency, there are 150 million dogs in China, 2005 (Website 12). Every ten Chinese have one dog, on average. In Beijing, there are about 500,000 dog owners. This means there one in every 20 residents owns a dog. Although the city council forbids residents keeping big dogs, many people have small dogs in their home.

Ward Thompson et al (2004) showed that there was difference between dog owners and non-dog owners. The research of Chinese HRFRA did not investigate the

percentage of dog owners because it might bias the results of the analysis, to a degree. In any future study, the author needs to be concerned with this issue and to avoid any bias.

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Appendix 1

(Appendix 4-1) PCA result of the pilot study		
COMPONENT 1	I like to visit the CCG to take a walk	.670
	I like to visit the CCG with many evergreens	.610
	I like to visit the CCG to meet friends	.587
	I like to visit the CCG in an informal style	.555
	I visit central communal land to take a shortcut	-.545
COMPONENT 2	I like to visit the CCG where I can see clearly from outside	.756
	I like to visit the CCG with a big hard surface square	.637
	I like to visit the CCG which is easy to get into	.576
	I like to visit central communal garden with big trees and big lawn	.467
COMPONENT 3	I like to visit the CCG to walk dogs	.696
COMPONENT 4	I like to visit the CCG with many shrubs to screen out surveillance	.786
	I like to visit the CCG enclosed by shrubs	.590
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 9 iterations. Eigen-value=1.2 KMO=.649 A total of 48% variance was explained by 13 variables		

(Appendix 6-1) Mean of Attitudinal Levels in Response to Environmental Preference Variables (Three Cities Together)		Mean	Std. Deviation	P-value
V16	To approach a natural environment	1.29	.753	.015
V14	To do some exercises	1.26	.780	.619
V15	To accompany children	1.12	.827	.024
V10	To go for a walk	1.11	.814	.000
V12	To meet friends	.811	.758	.006
V13	To join in some activities	.800	.822	.196
V17	To take a shortcut	-.171	1.128	.776
V11	To walk dogs	-.265	1.194	.000
vv26	A place without cars passing through	1.34	79.2	.000
vv31	A place with many evergreens	1.21	13.02	.001
vv34	With Pergolas and pavilions	1.17	3.65	.161
vv18	The proportion of the natural landscape is greater than the man-made landscape	1.14	36.74	.000
vv35	With many exercise facilities	1.08	7.97	.019
vv30	A place with many plants	1.02	15.14	.001
vv25	A large place where I can walk around it in 30 minutes	.914	2.41	.299
vv19	A big lawn with some trees	.83	17.15	.000
vv21	A garden in a geometric pattern	.74	2.17	.338
vv32	With a big children's playground with	.74	8.35	.015

Appendix 1

	facilities			
vv20	Like a forest	.73	12.08	.002
vv33	With many small squares	.68	29.33	.000
vv22	The trees, architecture and squares with vivid colours ;	.56	3.646	.162
vv24	A medium-sized place where I can walk around it in 15 minutes	.48	32.008	.000
vv27	A place without passers-by	.13	19.19	.000
vv28	A place without natural landform	-.145	16.71	.000
vv23	A small place where I can walk around it in 7 minutes	-.197	11.44	.003
vv36	With A snack bar	-.423	46.58	.000
vv29	A place without a stream or a pool	-.52	33.17	.000
vv39	A comfortable place to sit outside	1.32	.72238	.000
vv43	Design style is informal	1.19	.70947	.000
vv37	A quiet place	1.18	.77422	.000
vv42	Design style is simple and practical	1.06	.7247	.000
vv45	design style of CCG is Suitable to the style of residential buildings;	1.06	.8540	.000
vv38	A vibrant place	1.03	.8297	.931
vv40	An interesting place	.74	.8956	.073
vv44	Design style is Fashionable and leading	.53	.9096	.000
vv41	design style of CCG is Grand ;	-.06	.9711	.000

Appendix 9-1 Environmental preference variables which have significant differences between different frequency of use groups (K-W test)		OEUF	
		Chi-square	P-value
Gender		35.07	.001
Age		10.189	.017
Length of Residence			insignificant
Income		13.638	.003
Occupation		29.195	.000
OEUC		98.826	.000
To go for a walk;		31.254	.000
To walk dogs;		11.088	.011
To meet friends ;		30.97	.000
To join some activities ;		7.892	.048
To do some exercises ;		13.637	.003
To accompany children ;		12.615	.006
To approach natural environment ;		29.326	.000
the proportion of natural landscape is greater than man-made landscape ;		16.922	.001
A big lawn with some trees ;		9.331	.025
A place without cars passing through ;		17.235	.001
A place without natural landform ;		20.581	.000

A place without stream and pool ;	24.822	.000
A place with many evergreens ;		
With a big children playground with many facilities in it ;	12.103	.007
With pergolas and pavilions in it ;	12.411	.006
With many exercise facilities in it ;	18.262	.000
With a snack bar in it ;	14.891	.002
A quiet place ;		
A comfortable place to sit outside ;		
the design style of CCG is Grand ;	18.442	.000
the design style of CCG is Simple and practical ;	9.858	.020
the design style of CCG is Natural ;	13.233	.004
the design style of CCG is Suitable to the style of residential buildings;	14.089	.003

Appendix 9-2 Classification Table: Demographic vs Outdoor Environmental Use Frequency (H&L test: Chi-square= 2.829; P-value=.945, 3 Cities Together)

	Daily	Less Frequently	Percentage of correct	Overall percentage of correct
Daily	239	140	63.1%	63.9%
Less Frequently	169	308	64.6	

Appendix 9-3 Classification Table: Activity vs Outdoor Environmental Use Frequency (H&L test: Chi-square=6.565; P-value=.584, 3 Cities Together)

	Daily	Less Frequently	Percentage of correct	Overall percentage of correct
Daily	228	163	58.3%	59.9%
Less Frequently	193	303	61.1%	

Appendix 9-4 Classification Table: Physical Attributes vs Outdoor Environmental Use Frequency (H&L test: Chi-square=10.82; P-value=.212, 3 Cities Together)

	Daily	Less Frequently	Percentage of correct	Overall percentage of correct
Daily	230	157	59.4%	61.1%
Less Frequently	186	309	62.4	

Appendix 9-5 Classification Table: Design style & Perception vs Outdoor Environmental Use Frequency (H&L test: Chi-square= 46.038; P-value=.012, 3 Cities Together)

Appendix 1

	Daily	Less Frequently	Percentage of correct	Overall percentage of correct
Daily	208	139	59.9%	
Less Frequently	198	295	59.8%	

Appendix 9-6 Classification Table: Demographic vs Outdoor Environmental Use Frequency (H&L test: Chi-square=5.856; P-value=.663, Beijing)				
	Less Frequently	Daily		64.7%
Less Frequently	82	49	62.6%	
Daily	102	195	65.7%	

Appendix 9-7 Classification Table: Activity vs Outdoor Environmental Use Frequency (H&L test: Chi-square=10.372; P-value=.240, Beijing)				
	Less Frequently	Daily		62.6%
Less Frequently	77	49	61.1%	
Daily	107	184	63.2%	

Appendix 9-8 Classification Table: Physical Attributes vs Outdoor Environmental Use Frequency (H&L test: Chi-square= 10.560; P-value=.228, Beijing)				
	Less Frequently	Daily		62.7%
Less Frequently	74	35	67.9	
Daily	116	180	60.8	

Appendix 9-9 Classification Table: Demographic vs Outdoor Environmental Use Frequency (H&L test: Chi-square= 9.238; P-value=.161, Hangzhou)				
	Daily	Less Frequently	Percentage of correct	Overall percentage of correct
Daily	109	56	66.1	
Less Frequently	47	79	62.7	

Appendix 9-10 Classification Table: Activity vs Outdoor Environmental Use Frequency (H&L test: Chi-square= 13.892; P-value=.085, Hangzhou)				
	Daily	Less Frequently	Percentage of correct	Overall percentage of

Appendix 1

Daily	112	55	67.1	correct
Less Frequently	50	75	60	64%

Appendix 9-11 Classification Table: Physical Attributes vs Outdoor Environmental Use Frequency (H&L test: Chi-square = 8.168; P-value=.417, Hangzhou)				
	Daily	Less Frequently	Percentage of correct	Overall percentage of correct
Daily	104	58	64.2	63.9%
Less Frequently	47	82	63.6	

Appendix 9-12 Classification Table: Perception & Design Styles vs Outdoor Environmental Use Frequency (H&L test: Chi-square = 10.754; P-value=.216, Hangzhou)				
	Daily	Less Frequently	Percentage of correct	Overall percentage of correct
Daily	97	69	58.4	56.4%
Less Frequently	57	66	53.7	

Appendix 9-13 Classification Table: Demographic vs Outdoor Environmental Use Frequency (H&L test: Chi-square=5.917; P-value=.550, Shenzhen)				
	Less Frequently	Daily		64.4%
Less Frequently	63	31	67%	
Daily	27	42	60.9%	

Appendix 9-14 Classification Table: Physical Attributes vs Outdoor Environmental Use Frequency (H&L test: Chi-square=6.658; P-value=.574, Shenzhen)				
	Less Frequently	Daily		60.8%
Less Frequently	57	37	60.6%	
Daily	28	44	61.1%	

Appendix 9-15 Misclassification matrix of Outdoor Environmental Use Frequency—Demographics (3 Cities Together)				
Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	189	96	285

Appendix 1

	Satisfied	206	410	616
	Toatal	395	506	901
		Risk Statistics		
Risk estimate		0.33		
SE of Risk Estimate		0.014		

Appendix 9-16 Misclassification matrix of Outdoor Environmental Use Frequency—Activity (3 Cities Together)				
Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	176	126	302
	Satisfied	219	380	599
	Toatal	395	506	901
		Risk Statistics		
Risk estimate		0.38		
SE of Risk Estimate		0.015		

Appendix 9-17 Misclassification matrix of Outdoor Environmental Use Frequency—Physical Attributes (3 Cities Together)				
Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	161	103	264
	Satisfied	234	403	637
	Toatal	395	506	901
		Risk Statistics		
Risk estimate		0.37		
SE of Risk Estimate		0.014		

Appendix 9-18 Misclassification matrix of Outdoor Environmental Use Frequency—Perception & Design Styles (3 Cities Together)				
Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	153	84	237
	Satisfied	242	422	664
	Toatal	395	506	901
		Risk Statistics		
Risk estimate		0.36		
SE of Risk Estimate		0.014		

Appendix 9-19: Misclassification matrix ---Demographic vs OEUF (BEIJING)				
Predicted category		Actual category		
		Infrequent user	Frequent user	Total
	Infrequent user	63	50	113
	Frequent user	71	252	323
	Total	134	302	436
Risk Statistics				
Risk estimate		0.27		
SE of Risk Estimate		0.0197		

Appendix 9-20: Misclassification matrix ---Activity vs OEUF (BEIJING)				
Predicted category		Actual category		
		Less Frequently	Daily	Total
	Less Frequently	24	17	41
	Daily	110	285	395
	Total	134	302	436
Risk Statistics				
Risk estimate		0.285		
SE of Risk Estimate		0.0089		

Appendix 9-21: Misclassification matrix ---Physical Attributes vs OEUF (BEIJING)				
Predicted category		Actual category		
		Less Frequently	Daily	Total
	Less Frequently	38	30	57
	Daily	96	272	368
	Total	134	302	436
Risk Statistics				
Risk estimate		0.284		
SE of Risk Estimate		0.016		

Appendix 9-22: Misclassification matrix ---perception and design style vs OEUF (BEIJING)				
Predicted category		Actual category		
		Less Frequently	Daily	Total

Appendix 1

	Less Frequently	19	11	30
	Daily	115	291	406
	Total	134	302	436
		Risk Statistics		
Risk estimate		0.295		
SE of Risk Estimate		0.0083		

Appendix 9-23: Misclassification matrix—Demographic vs OEUF (Hangzhou)

Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	158	100	258
	Satisfied	9	32	41
	Toatal	167	132	299
		Risk Statistics		
Risk estimate		0.36		
SE of Risk Estimate		.0191		

Appendix 9-24: Misclassification matrix — Activity vs OEUF (Hangzhou)

Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	144	88	232
	Satisfied	23	44	67
	Toatal	167	132	299
		Risk Statistics		
Risk estimate		0.37		
SE of Risk Estimate		0.0234		

Appendix 9-25: Misclassification matrix ---Physical Attibutes vs OEUF (Hangzhou)

Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	114	56	170
	Satisfied	53	76	129
	Toatal	167	132	299
		Risk Statistics		
Risk estimate		0.36		
SE of Risk Estimate		.027		

Appendix 9-26: Misclassification matrix—Perception & Design Style vs OEUF (Hangzhou)				
Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	125	82	207
	Satisfied	42	50	92
	Toatal	167	132	299
Risk Statistics				
Risk estimate		.414		
SE of Risk Estimate		.026		

Appendix 9-27: Misclassification matrix ---Demogrphic vs OEUF (Shenzhen)				
Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	80	42	122
	Satisfied	14	30	44
	Toatal			
Risk Statistics				
Risk estimate		0.34		
SE of Risk Estimate		0.032		

Appendix 9-28: Misclassification matrix--Physical Attributes vs OEUF (Shenzhen)				
Predicted category		Actual category		
		Not satisfied	Satisfied	Total
	Not satisfied	72	36	108
	Satisfied	22	36	58
	Toatal	94	72	166
Risk Statistics				
Risk estimate		0.35		
SE of Risk Estimate		0.035		

Appendix 9-29: Classification Table for “Go for a walk” (3 cities together -Physical Attributes) (H&L test=7.194; P-value=.516)				
	Less likely	Likely	Percentage correct	74.4%
Less Likely	409	170	70.6%	

Likely	43	210	83%	
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Appendix 9-30: Classification Table for “Go for a walk” (3 cities together - Perception & Design Style) (H&L test=10.332; P-value=.243)				
	Less likely	Likely	Percentage correct	72.1%
Less Likely	427	174	71%	
Likely	66	194	74.6%	

Table 9-31: Classification Table for “walk dogs” (3 cities together -Physical Attributes) (H&L test=11.382; P-value=.181)				
	Less likely	Likely	Percentage correct	63.1%
Less Likely	368	232	61.3%	
Likely	80	165	67.3%	

Table 9-32 : Classification Table of Physical Behavioral Settings for “walk dogs” (Integrated Data - Perception & Design Style) (H&L test=5.630; P-value=.689)				
	Less likely	Likely	Percentage correct	58.8%
Less Likely	374	256	59.4%	
Likely	108	146	57.5%	

Table 9-33 : Classification Table of Physical Behavioral Settings for “To meet friends” (Integrated Data -Physical Characteristics) (H&L test=12.143; P-value=.145) Physical features				
	Less likely	Likely	Percentage correct	64.6%
Less Likely	169	92	64.8%	
Likely	213	388	64.6%	

Table 9-34 : Classification Table of Physical Behavioral Settings for “To do exercises” (Integrated Data -Physical Characteristics) (H&L test=12.051; P-value=.149)				
	Less likely	Likely	Percentage correct	71.1%
Less Likely	348	148	70.2%	

Likely	99	260	72.4%	
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Table 9-35: Classification Table of Physical Behavioral Settings for “To approach natural environment”

(Integrated Data -Physical Characteristics)

H&L test=10.533; P-value=.23

	Less likely	Likely	Percentage correct	79.5%
Less Likely	398	80	83.3%	
Likely	90	261	74.4%	

Table 9-36: Classification Table of Physical Behavioral Settings for “To approach natural environment”

(Integrated Data - Perception & Design Style)

(H&L test: Chi-square=13.342; P-value=.101)

	Less likely	Likely	Percentage correct	72%
Less Likely	341	166	67.3%	
Likely	81	294	78.4%	

Table 9-37: Classification Table of Physical Behavioral Settings for “Take a shortcut”

(Integrated Data -Physical Characteristics)

(H&L test=14.369; P-value=.073) Physical features

	Less likely	Likely	Percentage correct	67.3%
Less Likely	432	194	69%	
Likely	84	140	62.5%	

Table 8-38: Classification Table of Physical Behavioral Settings for “Take a shortcut”

(Integrated Data -Perception & Design Style)

(H&L test=15.321; P-value=.053)

	Less likely	Likely	Percentage correct	58.6%
Less Likely	384	261	59.5%	
Likely	109	139	56%	

Appendix 9-39 Classification Table of Physical Behavioral Settings for “Join some events”

(Integrated Data- Physical features)

(H&L test=12.126; P-value=.146)

	Less likely	Likely	Percentage	59.9%
--	-------------	--------	------------	-------

Appendix 1

			correct	
Less Likely	165	120	57.9%	
Likely	233	363	60.9%	

Appendix 9-40: Classification Table of Physical Behavioral Settings for “Join in some activities” (3 cities together-Perception & Design style)
(H&L test=4.508; P-value=.105)

	Less likely	Likely	Percentage correct	59.3%
Less Likely	140	146	49%	
Likely	214	385	64.3%	

Appendix 11-1: Correlations between Occupation, education and design style variable “informal” and “simple and practical”

		Occupation	Education	v42-	V43-informa l
Occupation	Pearson Correlation	1	.296(**)	-.107(**)	-.105(**)
	Sig. (2-tailed)		.000	.001	.002
	N	898	892	896	897
Education	Pearson Correlation	.296(**)	1	.118(**)	.084(*)
	Sig. (2-tailed)	.000		.000	.012
	N	892	896	894	895
v42- Simple and practical	Pearson Correlation	-.107(**)	.118(**)	1	.462(**)
	Sig. (2-tailed)	.001	.000		.000
	N	896	894	900	899
v43-informal	Pearson Correlation	-.105(**)	.084(*)	.462(**)	1
	Sig. (2-tailed)	.002	.012	.000	
	N	897	895	899	901

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Appendix 11-2: Partial Correlations between education and design style variable “informal” and “simple and practical”, with occupation is controlled for.

Control Variables			V42	V43	Occupation
Occupation	v42-simple and practical	Correlation	1.000	.455	.155
		Significance (2-tailed)	.	.000	.000
		df	0	886	886
	v43-informal	Correlation	.455	1.000	.121
		Significance (2-tailed)	.000	.	.000

Appendix 1

	Education	df	886	0	886
		Correlation	.155	.121	1.000
		Significance (2-tailed)	.000	.000	.
		df	886	886	0

Appendix 11-3: Partial Correlations between occupation and design style variable “informal” and “simple and practical”, with education is controlled for.

Control Variables			Occupation	V42	V43
Education	Occupation	Correlation	1.000	-.146	-.133
		Significance (2-tailed)	.	.000	.000
		df	0	886	886
	v42- simple and practical	Correlation	-.146	1.000	.456
		Significance (2-tailed)	.000	.	.000
		df	886	0	886
	v43- informal	Correlation	-.133	.456	1.000
		Significance (2-tailed)	.000	.000	.
		df	886	886	0

Appendix 11-4: Parameter Estimates for multinominal regression of Age and Income, in response to outdoor environmental use frequency

OEUF		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower bound	Upper bound
.0	Intercept	-1.22	.338	13.06	1	.000			
	Age=1	1.33	.332	16.21	1	.000	3.81	1.988	7.319
	Age=2	1.29	.342	14.29	1	.000	3.63	1.863	7.108
	Age=3	0(b)	.	.	0
	biIncome=1.0	-.360	.152	5.65	1	.017	.69	.518	.939
	biIncome=2.0	0(b)	.	.	0

a The reference category is: 1.0.

b This parameter is set to zero because it is redundant.

Appendix 11-5: Observed and Predicted Frequencies for multinominal regression of Age and Income, in response to outdoor environmental use frequency

Income	Age	OEUF	Frequency			Percentage	
			Observed	Predicted	Pearson	Observed	Predicted

					Residual		
Low income	Young-aged	.0	175	166.604	.869	46.2%	44.0%
		1.0	204	212.396	-.869	53.8%	56.0%
	Middle-aged	.0	71	77.038	-.910	39.4%	42.8%
		1.0	109	102.962	.910	60.6%	57.2%
	Older	.0	6	8.357	-.895	12.2%	17.1%
		1.0	43	40.643	.895	87.8%	82.9%
High income	Young-aged	.0	62	70.396	-1.459	46.6%	52.9%
		1.0	71	62.604	1.459	53.4%	47.1%
	Middle-aged	.0	64	57.962	1.142	57.1%	51.8%
		1.0	48	54.038	-1.142	42.9%	48.2%
	Older	.0	6	3.643	1.405	37.5%	22.8%
		1.0	10	12.357	-1.405	62.5%	77.2%

The percentages are based on total observed frequencies in each subpopulation.

Appendix 2 (Questionnaire)

Part 1: Background

1. Gender: (1) Male; (2) Female;
2. Age: (1) 18~34; (2) 35~60 (3) 61~
3. Length of Residence:
(1) Less than half a year; (2) a year ; (3) two years; (4) three years or more;
4. Number of family members:
(1)1; (2) 2; (3) 3; (4) 4; (5) 5;
5. Income:
(1) less than £150; (2) £151~£325 ; (3) £326~£525 ;(4) more than £526;
6. Occupation:
(1) Retired; (2) Student; (3) unemployed; (4) part-time Job; (5) Full-time Job;
7. Education:
(1)Equal or lower than High School; (2) College ; (3) Bachelor ;(4) Master or higher;

Part 2: Behavioural Section

8. How often do you visit Central Communal Land:
(1) Daily; (2) weekly; (3) monthly; (4) seldom/rarely ;
9. Your Childhood outdoor environmental use frequency is:
(1) Daily; (2) weekly; (3) monthly; (4) seldom/rarely ;

Part 3: Environmental Preference

Options and Requirement:

For each statement, please give one response that best describe what you think;

There is no right or wrong for the answers, it is your opinion that counts;

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

Question		Options				
		Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Activity	I visit/would visit CCG					
	10 To go for a walk	1	2	3	4	5
	11 To walk dogs	1	2	3	4	5
	12 To meet friends	1	2	3	4	5
	13 To join in some activities	1	2	3	4	5
	I visit/would visit CCG					
	14 To do some exercises	1	2	3	4	5
	15 To accompany children	1	2	3	4	5
	16 To approach a natural environment	1	2	3	4	5
	17 To take a shortcut	1	2	3	4	5
BIRD'S-EYE VIEW	Looking outside from my window, I hope to see:					
	18 The proportion of the natural landscape is greater than the man-made one	1	2	3	4	5
	19 A big lawn with some tall trees	1	2	3	4	5
	20 The CCG like a forest;	1	2	3	4	5
	21 A garden in a geometric pattern	1	2	3	4	5
AREA & SAFETY	22 The trees, architecture and squares with vivid colours	1	2	3	4	5
	I hope the CCG is :					
	23 A small place where I can walk around it in 7 minutes ;	1	2	3	4	5
	24 A medium-sized place where I can walk around it in 15 minutes;	1	2	3	4	5
	25 A large place where I can walk around it in 30 minutes ;	1	2	3	4	5
NATURAL ELEMENT	26 A place without cars getting through ;	1	2	3	4	5
	27 A place without passer-by;	1	2	3	4	5
	I hope the CCG is :					
	28 A place without informal landforms	1	2	3	4	5
	29 A place without a stream or a pool	1	2	3	4	5
FACILITIES	30 A place with many plants	1	2	3	4	5
	31 A place with many evergreens	1	2	3	4	5
	I hope the CCG has					
	32 A big children's playground with many facilities in it	1	2	3	4	5
	33 Many small squares in it	1	2	3	4	5
	34 Pergolas and pavilions in it	1	2	3	4	5
	35 Many exercise facilities in it	1	2	3	4	5
	36 A snack bar in it	1	2	3	4	5

Question		Options				
		Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
ON PERCEPT	I think the CCG should be					
	37 A quiet place	1	2	3	4	5
	38 A vibrant place	1	2	3	4	5
	39 A comfortable place	1	2	3	4	5
	40 An interesting place	1	2	3	4	5
STYLE DESIGN	I prefer the design style of CCG is					
	41 Grand	1	2	3	4	5
	42 Simple and practical	1	2	3	4	5
	43 Informal	1	2	3	4	5
	44 Fashionable and leading	1	2	3	4	5
	45 Suitable to the style of residential buildings	1	2	3	4	5

Part 3: Importance Level of Environmental Judgement

Please give one response to each item on the left side of the table below. This response accords to the importance level which you think each aspect is from 1 (Totally Important) to 7 (Totally Unimportant), and help us to measure the subjective evaluation in a whole.

ENVIRONMENTAL COMPONENTS		Very Important	Slightly Important	Important	Neutral	Slightly Un-important	Un-important	Very Un-important
	A Activity	1	2	3	4	5	6	7
	B Bird's-eye view	1	2	3	4	5	6	7
	C Area & Safety	1	2	3	4	5	6	7
	D Nature Element	1	2	3	4	5	6	7
	E Facilities	1	2	3	4	5	6	7
	F Perception	1	2	3	4	5	6	7
	G Design Style	1	2	3	4	5	6	7

Thank you for your cooperation Sept ,2006

Appendix 3 (Questionnaire of Pilot Study)

Part 1: Background

1. Gender: (1) Male; (2) Female;
2. Age: (1) 18~34; (2) 35~60 (3) 61~
3. Length of Residence:
(1) Less than half a year; (2) a year ; (3) two years; (4) three years or more;
4. Number of family members:
(1)1; (2) 2; (3) 3; (4) 4; (5) 5;
5. Income:
(1) less than £150; (2) £151~£325 ; (3) £326~£525 ;(4) more than £526;
6. Occupation:
(1) Retired; (2) Student; (3) unemployed; (4) part-time Job; (5) Full-time Job;
7. Education:
(1)Equal or lower than High School; (2) College ; (3) Bachelor ;(4) Master or higher;

Part 2: Environmental Preference

Options and Requirement:

For each statement, please give one response that best describe what you think;

There is no right or wrong for the answers, it is your opinion that counts;

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

Question	Options				
	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I like the building entrance					
8 Without people popping around	1	2	3	4	5
9 With some benches	1	2	3	4	5
I prefer the buffer zone of the buildings					
10 enclosed by shrubs	1	2	3	4	5
11 decorated by trees rather than shrubs	1	2	3	4	5
12 Wide enough to keep from noise	1	2	3	4	5

13	To take a shortcut	1	2	3	4	5
	I prefer the buffer zone of the buildings					
14	higher than the level of street	1	2	3	4	5
15	a private space	1	2	3	4	5
16	used for children's playing	1	2	3	4	5
	I like the street of the residential area :					
17	likes a boulevard	1	2	3	4	5
18	with clear edges defined by the shrubs	1	2	3	4	5
19	a straight line	1	2	3	4	5
	I like to visit the CCG :					
20	with big trees and lawn	1	2	3	4	5
21	with many shrubs to avoid the surveillance	1	2	3	4	5
22	with many evergreens	1	2	3	4	5
	I hope the CCG is:					
23	in an informal style	1	2	3	4	5
24	with a big hard surface square	1	2	3	4	5
25	with a man-made lake	1	2	3	4	5
	I like to visit the CCG:					
26	which is easy to get into	1	2	3	4	5
27	where I can see from outside	1	2	3	4	5
28	enclosed by shrubs	1	2	3	4	5
	I prefer to visit the CCG:					
29	Take a walk	1	2	3	4	5
30	Walk dogs	1	2	3	4	5
31	Meet friends	1	2	3	4	5
32	Take a shortcut	1	2	3	4	5
	I like the sports field:					
33	close to my home (no more than 3~5 minute walk)					
34	far away to avoid noise					
35	on my way home					
	I dislike the children's playground:					
36	Is used by children in my buildings only					
37	Is located at a place where I can see from home					
38	Is put far away					

Part 3:

Satisfaction level in response to the outdoor environment of the HRFRA in which you live:

Please give one response to each item on the left side of the table below. This response accords to the importance level which you think each aspect is from -2 (Dissatisfied) to 2 (Satisfied).

		Dissatisfied	Slightly dissatisfied	Neutral	Slightly satisfied	Satisfied	Where do you like? Why?	Where do you dislike? Why?
ENVIRONMENTAL	The buffer zone between buildings and other streets	-2	-1	0	1	2		

Appendix 3

The building entrance	-2	-1	0	1	2		
The street of the residential area	-2	-1	0	1	2		
The central community garden	-2	-1	0	1	2		
The sports field and facilities	-2	-1	0	1	2		
Children's playground	-2	-1	0	1	2		
	-2	-1	0	1	2		

Thank you for your cooperation October 0f 2005

Appendix 4 Papers Published

1. The Study of the Relationship between the Frequency of Use and Environmental Design of High-rise Residential Area in Hangzhou (in *Architecural Journal*, April of 2008. p.39-50)

杭州高层住宅景观设计与使用频度研究

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摘要：

景观设计与居民的生活质量 (Quality of Life) 密切相关。本文从环境心理学角度, 通过对居民常见行为、环境设计特点和心理感受三个方面的研究, 结合戴维·肯特的场所设计理论

，探讨景观设计各个方面对于居民室外环境使用频率的影响。研究发现功能设施与自然元素对居民的使用频率影响较大。同时，结合乔治·凯利的个人构建心理学，探讨居民的现有室外环境使用频率与少年时期与自然环境的接触之间的相互关系后得出两者之间密切相关的结论。

Landscape Design correlates to Quality of Life. This study explores the relationship between Outdoor Environmental Use Frequency and components of Canter's Place Theory, from the angle of Environmental Psychology. The analysis results show that the indicators of Environmental Affordances-plants and facilities, have bigger influences on people's actual use than other aspects. On the other hand, the guideline of Kelly's Personal Construct Psychology is suitable for Chinese outdoor environmental uses. The habit formed in childhood influences residents' outdoor environmental uses as adults.

关键词：景观设计，高层住宅，场所理论，公共健康，个人构建心理学

Landscape Design, High-rise Flat, Theory of Place, Public Health, Psychology of Personal Construct

研究目的：

本文旨在通过对高层住宅区居民室外环境使用频度与场所构成要素之间的相互关系的研究，探索景观设计中居民户外活动起决定性作用的物质因素与心理因素。试从整体角度，结合高层住宅的自身特点，探讨建筑师与景观设计师如何根据居民自身的行为特点和对外界环境的要求，提高设计质量，促进景观设计的本土化发展。

具体目标如下：

- 1) 影响居民环境使用频度的场所构成因素；
- 2) 为设计师提供基于实际使用情况的现实设计依据。

前言：

高层住宅 19 世纪末欧洲大陆出现后，在美国得到了迅猛的发展。其主要原因是建筑材料和钢铁技术的广泛应用，使得简易轻便的高强度框架结构取代了传统的砖石结构，突破了这

道上千年历史的技术和材料障碍。正如理查德·普朗兹(Plaunz,1990) 所描述的“芝加哥建筑师团体在 19 世纪 80 年代解决了限制建筑高度的技术问题,从而使高层建筑在全世界迅速蔓延开来” [1]。

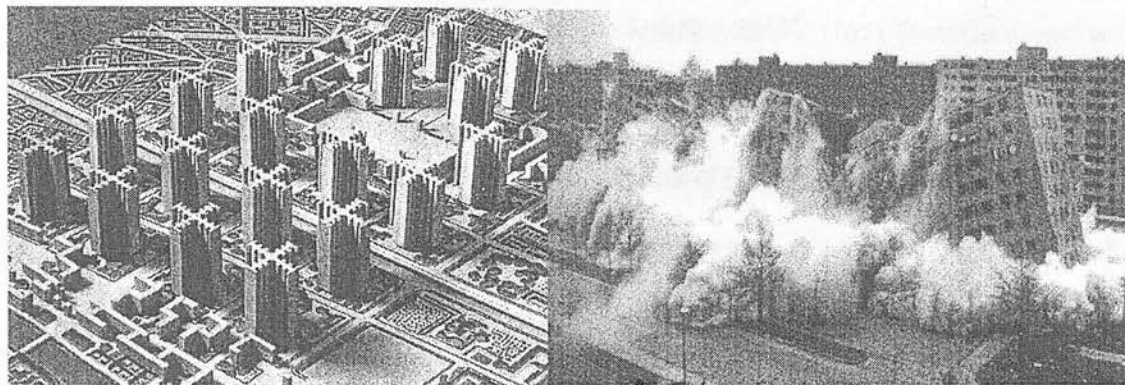
然而材料和新技术的突破并未改变人们传统观念当中对于住宅的理解。高层住宅的发展一直是在争论与波折中前行。尤其是在二次大战后的重建过程中,为了缓解人口增长与经济复苏所兴建的大批现代化高层建筑,饱受各方面的诟病。“在 20 世纪 6、70 年代,人们对于高层住宅的热情逐渐转化为普遍性的厌恶”[2]。环境心理学在这个过程中充当了重要的角色。美国圣路易斯的普鲁埃特-伊果 (Pruite-Igoe) 公寓大楼的被毁就是一个重要的标志 [3] (图-1)。这与现代派设计大师的初衷所希望的理想与秩序的乌托邦南辕北辙。伊果公寓的被毁有诸多原因,但是无法否认的一点是环境作为居民日常接触的重要生存空间,其冷漠的外表和僵硬的室外环境阻碍了居民对环境的认同,进而引发了诸多的社会问题。这个例子表明设计的成功与否并不是单纯的以设计师的个人理想而转移的。兴起于 40 年代,发展与二次大战以后,繁荣于 70 年代至今的环境心理学从多方面探讨了人与环境之间的关系,力图将这些矛盾因素清晰地呈现在人们面前。

作为人本设计的中心,环境心理学的目的是探讨人与环境之间的相互关系,为设计和实践提供良好的理论与现实依据。其研究在西方国家已经有半个世纪的历史。各种学派和理论不断涌现。随着格式塔心理学的发展,心理学研究逐渐从单纯的诊所环境中走出,融入到社会生活的各个方面。凯文林奇的《城市意向》作为早期的环境心理学研究成果,已为众多设计师所接受。但其研究方法只是认知心理学的一个方面,多数研究并不为中国设计者所熟知。在众多的理论当中,简·阿普雷顿 (Jay Appleton)的前景--逃避理论(Prospect-refuge Theory) [4],詹姆斯·吉布森(James J Gibson)的环境供给理论(Environmental Affordances) [5]与戴维·肯特(David Canter)的场所理论(Theory of Place) [6]是应用较为广泛的支柱理论。

中国在 70 年代末改革开放政策实施后,经济迅猛发展,城市建设也随之突飞猛进。经济和社会的繁荣为环境心理学研究提供了良好的发展基础和研究对象。也为设计的本土化发展

提供了契机。然而在景观设计中，设计者的目光仍然只是局限在传统设计理论与照搬国外设计的框架上，缺乏对于自身特点了解和对现实情况的研究。与现代设计严重脱节。

为此，本文借鉴环境心理学研究方法和基本理论，总结国外有关居住区环境绿地与使用情况的研究，力图通过对建成的住宅小区的调查，总结中国高层建筑居民的行为特点与环境设计的具体关系，为设计师和房地产开发商提供第一手资料。

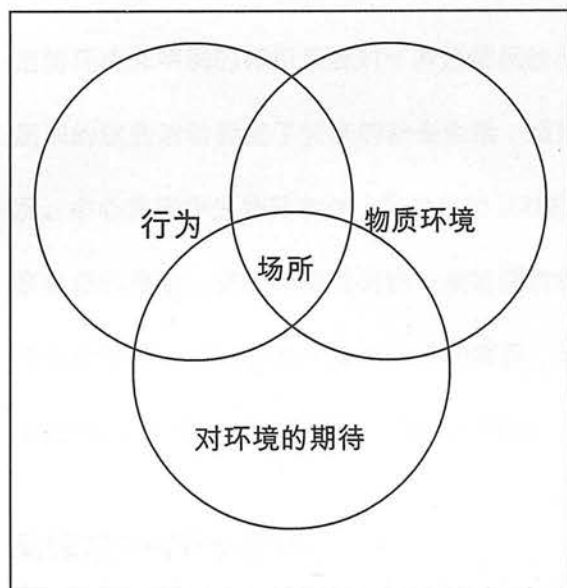


柯布西埃 1925 年所作的巴黎规划，成为经典的 20 世纪现代城市景观代表。

山崎实设计的普鲁埃特-伊果 (Pruitt-Igoe) 公寓的被毁 (1972 年) 标志着高层现代建筑时代的结束。

图-1

理论框架与文献回顾：



卡哈纳 [7] (Kahana, 2006), 凯尔尼 [8] (Kearney, 2006), 海恩伍德和皮杰恩 [9] (Henwood and Pidgeon, 2001) 也在他们的研究中证明自然环境能够促进居民的环境实用活动并减轻城市环境所造成的压力，从而促进公共健康。

中心花园作为室外环境空间，在居民的休闲方面起着很大的作用。从设计角度来讲，其内容主要体现在三个方面。戴维·肯特

的场所理论 [6] (Canter, 1975) 认为人的场所感由物质环境 (Physical Attribute)、发生在场所

内的行为 (Activity) 和对于环境的期待 (Concept of the environment) 共同组成 (图-2) 。这三个方面相互影响, 共同作用。肯特的场所理论作为核心与基础, 其中的环境期待所包含的内容过于广泛, 超出了实际设计所能控制的范围。环境期待包含了许多先天与后天的因素在里面。尤其是个人经历, 教育背景, 经济状况和个人性格因素等方面。在实际的应用中, 往往由代表人们对于环境质量评价的感觉 (Perception) 所取代。在众多的影响因素当中, 个人经历尤其需要重视。乔治·凯利的《个人构建心理学》[10] (Personal Construct Psychology, 1977) 研究了人的成长经历中各种要素对于成年之后行为模式的影响。并且得出结论人在幼年所受的教育与习惯会在成年之后继续存在, 并以一种渠化 (channel) 的方式得以再现。这一点对于处于飞速城市化进程中的中国景观设计有重要意义。由于经济的迅速发展, 乡村居民大量涌入城市。幼年生活环境的影响直接关系到这些新的城市移民对于城市环境的评价和使用。所以本文将此列为研究的一个方面。

在现实生活中, 环境设计质量通过居民的实际使用得以衡量。杨·盖尔[11] (Jan Gehl, 1987) 在对哥本哈根的居民区进行调查后发现, 居民在室外环境中的停留时间长短受环境影响很大, 尤其是选择性休闲和社交行为。汤姆森[12] (Thompson, 2004) 在为苏格兰国家森林委员会所作的研究也得出相同的结论。在爱丁堡的城市绿地使用中, 良好的景观设计, 整洁的环境和明确的标识系统对于附近居民的使用有良好的促进作用。

居民的这些活动促进了社区的社会生活, 减弱了现代社会所带来的人际关系相对冷漠的情况。中心花园作为物质载体, 为居民的活动提供了机会。“社区的成员通过相互的聚集, 分享各自的经验, 交流心得并为进一步的探索和融合创造条件” [13] (Madanipour, 1996) 。并在此基础上享受自然环境所给予的减压, 怡情等健康好处。从而实现景观设计真正意义上的“以人为本”, 将“天人合一”落实到实处。

研究方法与评价程序：

数据采集过程中主要的方法为问卷调查法。调查对象为高密度住宅区的现有居民。为确保

居民对于环境的熟悉程度，研究者选择了建成超过 2 年的小区。小区选择三个主要依据为：1) 居住区建成时间 2 年以上；2) 容积率高于 2.5，3) 有建成的中心花园。此次研究调查了位于杭州萧山区的两个高密度住宅小区——世贸大厦和家景园。

调查采取问卷形式，由居民在现场即时填写。并由调查人员现场解答被测试者的问题。研究者采取了严格的筛选标准。共取得有效问卷 299 份。

问卷设计：

问卷采用里科特 5 分量表 (Likert Five Point Scale) 的形式。根据相关研究与景观设计中较为常用的分类，问卷内容包括 1) 评价方法的介绍，个人统计数据 (Demographic)；2) 中心花园俯视效果 (Bird's-eye view)；3) 自然要素 (Natural Elements) (包括地形，水体，植物等)；4) 安全与面积 (Area and Safety)；5) 设施情况 (Facilities)；6) 设计风格 (Design Style)；7) 心理感觉 (Perception) 等 7 个方面共 47 个问题。

鉴于高密度住宅区的具体情况，本文借鉴并融合了国外相关研究成果和理论基础，结合中国景观设计的具体情况进行问卷设计。并未照搬成套的固定研究模式，因此带有较强的适应性，适合中国的具体情况。从整体的测试结果来看，居民对于问卷的反映良好，达到研究的预期目标。

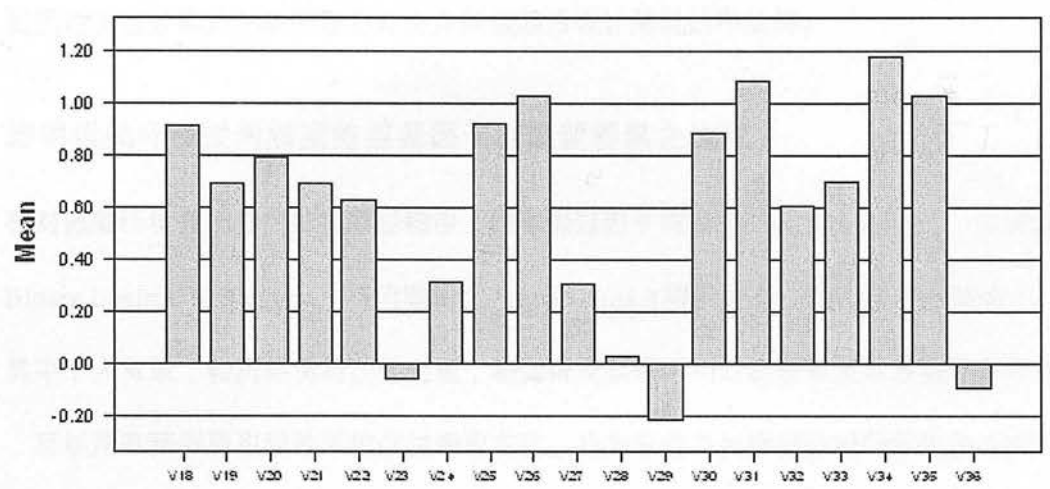
数据分析结果：

平均值分析

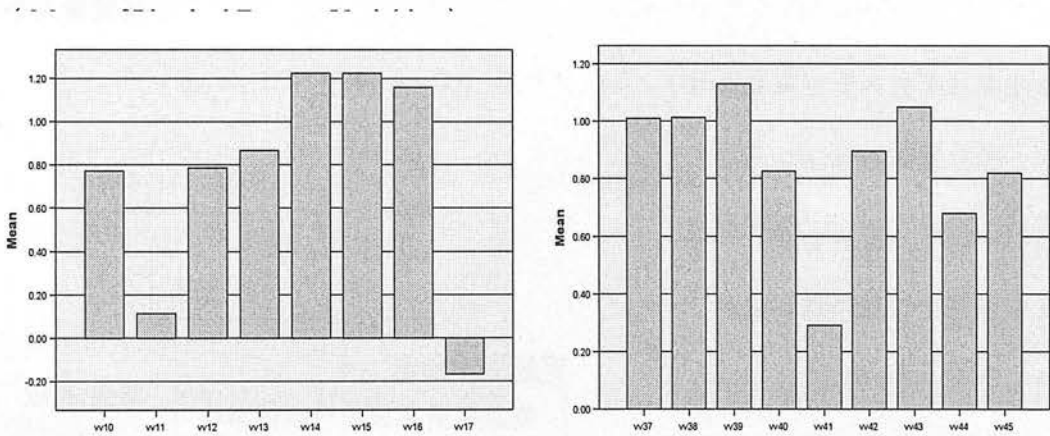
平均值分析的主要目的是将各提问方面的主要得分通过平均值的方式进行比较，从整体上比较居民在各个方面总体倾向性。

环境特征分类中包含 19 个选项 (图-3)，其中 18-自然环境面积达与人工设施面积；V25-面积较大，30 分钟左右走一周；V26-没有机动车穿过；V30-有很多植物，V31-有很多常绿树；V34-有亭廊与花架等休息设施；V35-有一些运动设施得分较高。

而 V23-面积较小，可在 7 分钟内走完一周；V28-没有自然地形的地方；V29-没有水体和溪流的地方；V36-有食品销售车 这得分较低，甚至是反对态度。尤其是 23、29 和 36 选项的反对态度尤其强烈。



环境特征平均值比较 (图-3)



行为变量平均值比较 (图-4)

感知变量平均值比较 (图-5)

通过(图-4)我们可以发现，在居民的日常行为当中，在花园中溜狗(v12)与穿行抄近道(v17)是两个得分较低的选项，尤其是抄近道，得到了负值。在得分较高的选项中，参加活动(v13)，陪孩子玩(v15)和接近自然环境(v16)都被包含在内。尤其 14、15 和 16 选项，得分高出其他选项很多。这说明这三种活动普遍受居民欢迎，是日常生活中最为经常的活动。

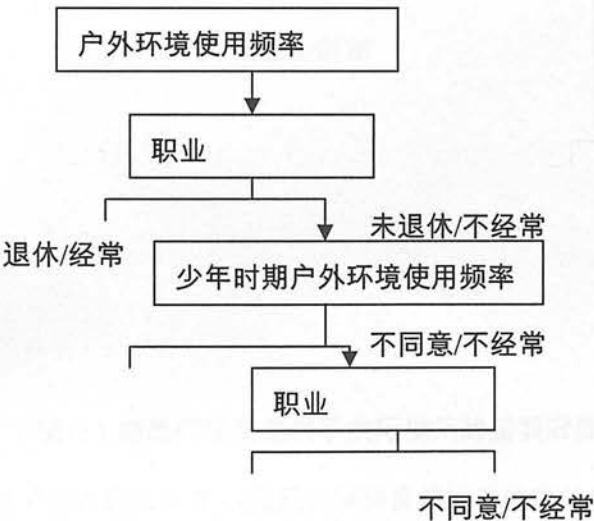
在感知变量的平均值比较中(图-5)我们可以发现，杭州居民对于环境的舒适性(v39)、自

然亲切地感觉(v43)和安静 (v37)等特点表现出较好的态度。充满活力的室外环境(v38), 简单实用(v42)、新奇有趣(v40)和自然环境与建筑环境的协调(v45)等方面也有高的评价。在这些评价因子中, 现代时尚的的设计(v44)和富丽堂皇的设计风格(v41)得分较低, 这也反映出居民对于过分商业化而不顾自身特点照搬西方设计形式的不认同。

影响居民环境使用频度的重要因子与重要程度之比较

在对重要环境因子的分析提取过程中, 作者通过因子筛选 (Data Screening), 二元回归 (Binary Logistic Regression) 与问题树 (Answer-Tree) 进行分析, 得出最终的结论: 其中个人背景, 物质环境特征类变量, 感觉类变量类的回归模型与实际数据分布差异较小, 可以用来预测所引起的环境使用频率变化。行为变量二元回归分析回归模型与实际数据间的差距较大, 因此该分类内容仅列出供大家参考。

个人背景类:



(图-6) 个人背景变量对于实际使用的重要程度

如果受测试者在童年时期经常从事户外运动或经常接触自然, 那么在成年之后, 这种习惯仍会保持下来, 较为频繁的进行户外活动。而职务对居民的室外环境使用起负面作用, 随着居民的工作时间的增加, 居民的户外活动频率降低。从退休人员到全职工作人员, 整个频率呈递减趋势

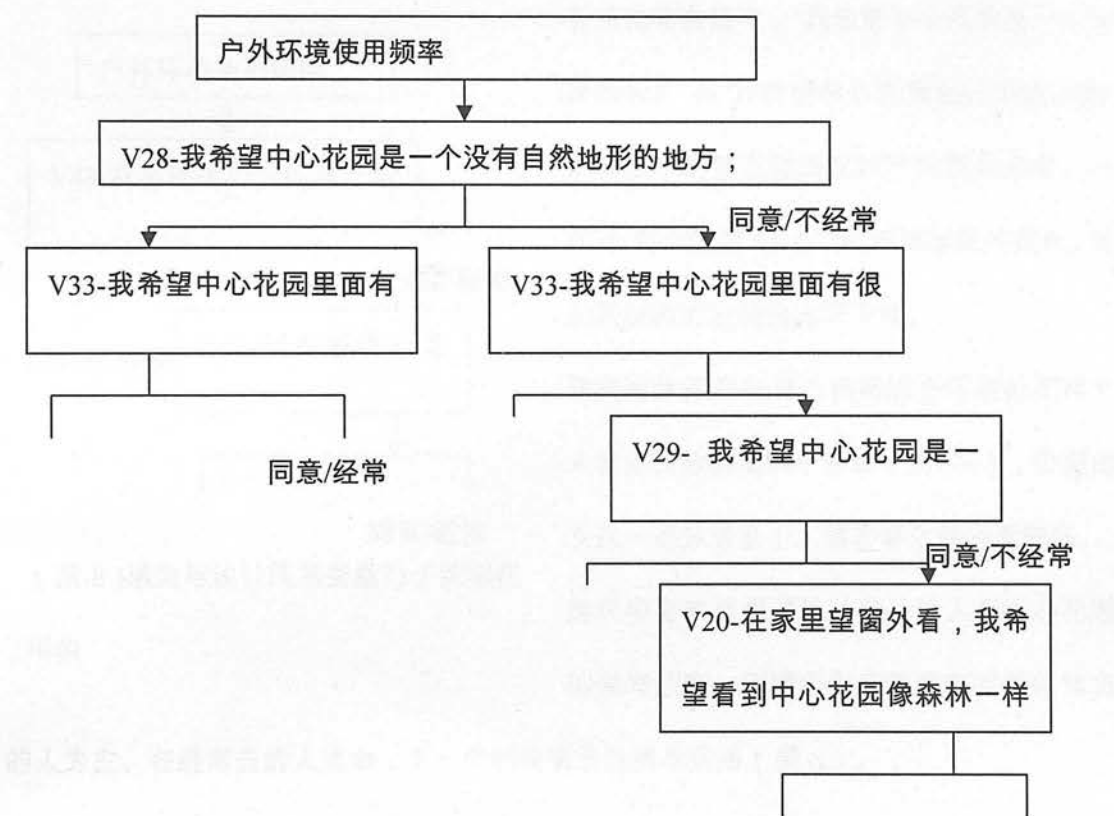
居民的户外活动频率, 随着年龄的增长而增多, 年纪大的人比年纪小的人更频繁的使用室外空间。尤其是 55 岁以上的人群。总体来讲, 职业对于居民的户外活动频率影响最大, 其中退休人员是最为经常地使用者。

而对于那些仍然在工作或学习的居民来说，少年时期的环境使用频率则是下一个判别标准，如果他们在童年较少接触自然环境的话，在成年后仍然不会经常使用中心花园（图-6）。

行为类：

在行为方面，到“中心花园区见朋友”对使用频率有促进作用，而“抄近路”的人则较少使用中心花园。

物质环境类：



(图-7) 物质环境变量对于实际使用的重要程度 不同意/不经常

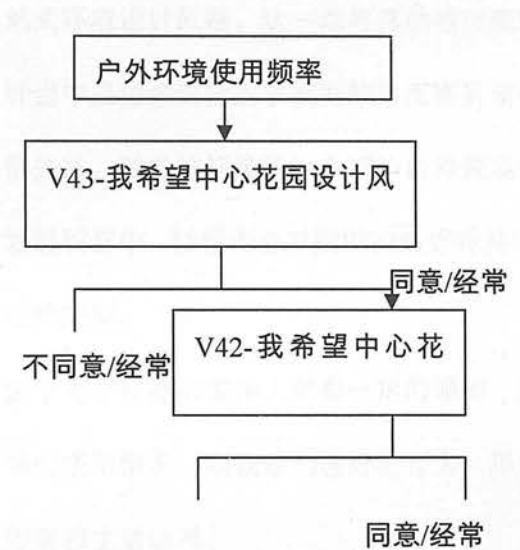
对于室外物质环境，居民对没有自然地形的室外环境持反对态度，它将会减少居民的使用频率。同时，花园里面的小广场可以提高居民的户外使用频率。

在对没有自然地形的中心花园设计持反对意见的人使用频率较高，也就是说，大多数喜欢到户外活动的居民都比较喜欢有自然地形的环境。在这一分支中，铺装场地的数量是下一个使用频率的判别因素。由于铺装场地的数量直接影响到居民的使用方便程度和活动的私

密性--免受过多外界环境干扰，使得使用户外环境较多的居民对这一项环境因子比较重视。

在不支持中心花园有自然地形的人当中，他们的户外活动频率较低。总体来说，对于室外环境是用较少的居民喜欢相对较为空旷、硬质景观较多的环境。具体显示在它们不喜欢水景和树木茂盛的环境。如果居民当中又具有这一类环境倾向性的人，那么它们的环境使用频率相对较低。其重要程度分级见图-7

感觉与设计风格类：



(图-8)感觉与设计风格变量对于实际使用的

在感觉类变量中，“我希望中心花园是一个安静的地方”和“我希望中心花园设计风格自然”两个因子能够促进居民的户外使用频率。而相对“简单适用”的设计则不被居民所喜欢。居民到花园的次数因此而下降。

感觉类元素的判别比例相比于环境特征和个人背景的分辨正确率较低（58.6%），主要由于这一部分涉及个人喜好等主观因素较多。

居民中喜欢自然式设计风格的人到中心花园的频率较高，而持反对意见的则以不经常去

的人为主。在经常去的人当中，下一个判别因子为简单适用（图-8）。

结论与建议：

研究表明，由于职业和童年经历的影响，全职工作者对环境的使用较少，而以退休老人为主的群体则属于使用频率较高的人群，年龄分区在 55 岁左右。当职业限制与童年习惯发生对比时，职业和工作情况起决定性作用。在实际使用当中，多数青壮年居民由于工作性质的限制，可供自由支配的时间较少，因而影响到他们的使用。但是如果在少年时代就有接

近自然环境的习惯，即使成年后工作再忙，也会保持一定的活动频率。

在实际的设计当中，良好的自然地形设计和适量的铺装场地能增加居民对于环境的使用。

只有当环境中自然要素比例较大，而且活动设施和场地满足需要后，居民才会注意审美及视觉效果。其中俯视视觉效果对杭州居民的使用不起决定性作用。但是对于不经常使用室外环境的居民，该选项有一定的影响。

自然与简单适用的设计风格是高频率使用者的共同希望。设计中应避免过于人工化和复杂的景观设计，尤其是过于西化的设计风格。减少过多的几何构图元素，力求获得恬静的自然式环境设计风格。这一点与其他城市景观设计有本质性区别。建筑师与景观师在实际设计当中应避免过分追求视觉效果而盲目增设人工景观的做法。但同时应当协调好两者的比例关系。过多的铺装场地会减少自然景观的比例。另外一个值得注意的地方是建筑师在规划过程当中，预留中心花园面积最好保持在 $9,000\text{m}^2$ 以上，保证居民有较为放松且感觉舒适的空间。

由于每个楼盘的使用人群有一定的倾向，建筑师和景观师可以根据不同特点的人对室外环境的使用情况，根据他们喜好的行为、环境倾向性进行具体定位设计风格。从而提高环境质量和生活标准。

致谢：

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2. Prospect or Affordances: Qualitative Threshold for Chinese Outdoor Environmental Use (Poster In: Open space research centre: Innovative Approaches to Research Excellence in Landscape and Health Conference. Sept 19-21, 2007, Edinburgh, UK)

PROSPECT OR AFFORDANCE: THRESHOLD FOR CHINESE OUTDOOR ENVIRONMENTAL USE

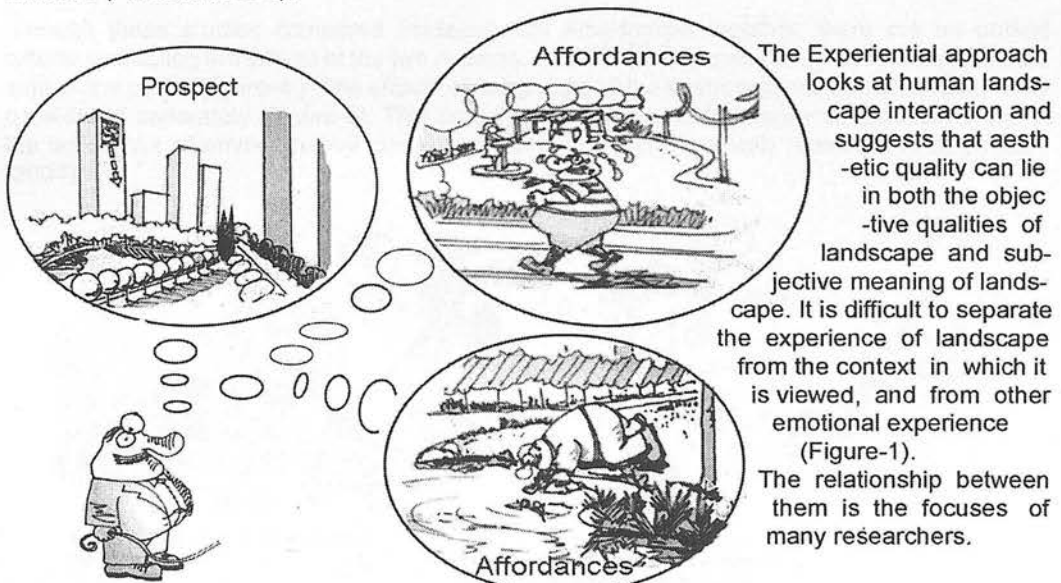
Xing-Yuan Fu, Edinburgh College of Art. Email: xingyuan.fu@eca.ac.uk

Aim:

Designers often believe that good environmental design improves the quality of life. Prospect and Affordance, as two important aspects of the environment may have big influence on people's real use of outdoor space. This study aims to compare the effects of both Prospect and Affordance on people's use of outdoor environment, through the investigation of the relationship between outdoor environmental use frequency and High-rise Flat Residential Areas (HRFRA) residents' preferred environment.

Introduction:

Given the different attributes of Prospect and Affordances, most of the studies concentrate on the two aspects of the environment respectively. In real world, the two aspects connect with each other. The information gathering behaviour needs emotional stimuli and fast assessment of contents (Frascara, 2004).



(Figure-1) Why am I here? What attract me to use the Central Communal Garden?
Prospect or Affordances?
Who can tell me?

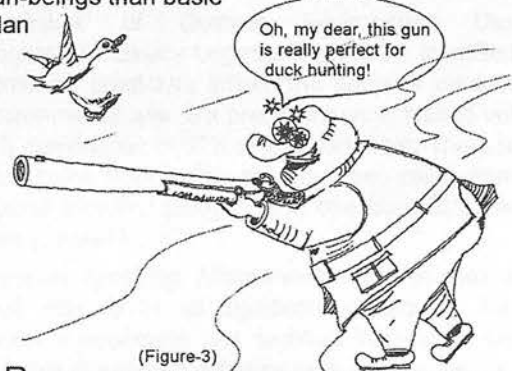
The relationship between Prospect & Affordances

Both concepts contain the functional information of the environment which observer take advantage of for activities. Appleton (1996) highlighted the important influence of Prospect which aids animal/people to overview the environment, react to hazards and further to survive in the habitat. Hartig and Evans (1993) pointed out the Prospect-Refuge theory is a description of landscape in terms of prospect and refuge affordances, that is, the functional values of landscape, as Gibson (1979, p 127) defined "The affordances of the environment are what it offers the animal, what it provides or furnishes, either good or ill".

However, Prospect and Affordances have different focuses and tend to be studied separately. The aesthetic focus often makes Prospect different in practice with Affordances' functional focuses, and treated as the higher need of human-beings than basic functional aspects. The study of Kaplan and Kaplan (1989) showed the subtle relationships of them that settings suitable for survival are preferred environments with functions, and tend to be regarded aesthetically (Figure-2 and Figure-3).



(Figure-2)



(Figure-3)

Role transferring of the observers is the other difference between Prospect & Affordances.

People look down at the environment from high level partly because panorama can gave more information than the eye level (Wang and Chien, 1999). Prospect is more likely to be for the observer away from the site, and Affordances is the contents of the environment for the participant in the site.

Though these studies compared Prospect with Affordances together, there are no unified criteria evaluating the effects of the two aspects. According to Gestalt theory, the whole is not the sum of the parts (Figure-4). The effects of subgroups of the environmental contents need to be considered separately (Figure-5). This study use practical use frequency as criterion to check the influences of environmental contents on people's behaviour with reference to Thompson (2004).



Figure-4 "the whole is not the sum of the parts."

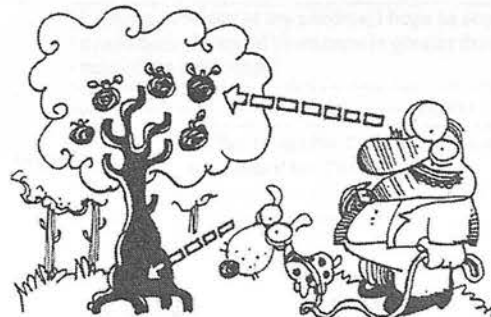


Figure-5 The perceptor of the form is not an objective fact. The subject isolates the figure according to his attention and his needs.

Research Method

The survey focuses on the Central Communal Garden (CCG) of three High-rise Residential Areas (HRFRA) of Beijing,China, in summer of 2006. Responses from a total of 437 subjects were collected on site (Figure-6). A total of 437 valid questionnaires were collected excluding 27 invalid (5.8% in total).



Analysis and Results

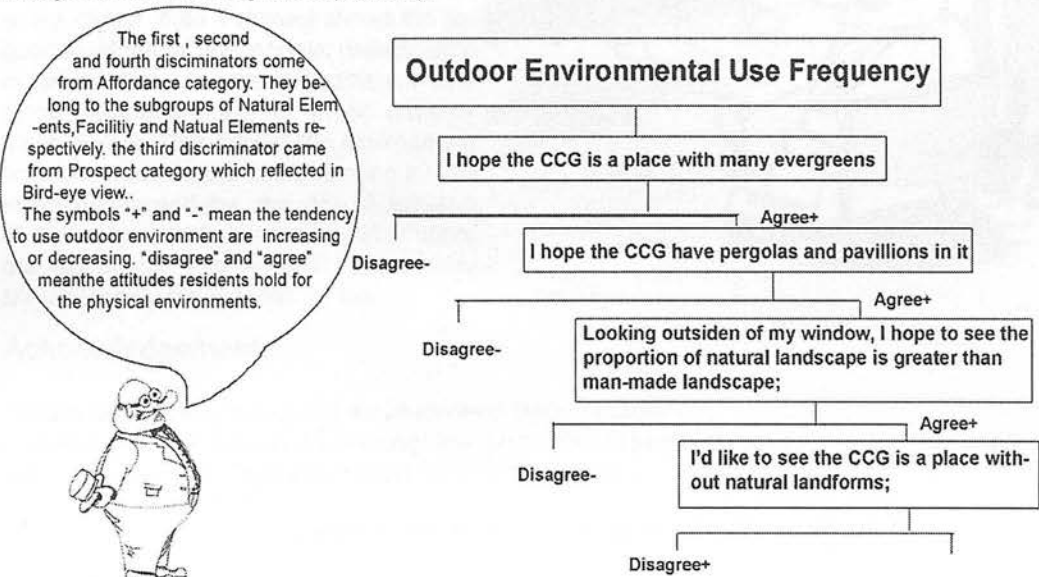
Beijing	Outdoor Environment Use Frequency)	Wald	P-value	Exp(B)
Bird-eye View (Prospect)	Looking outside of my window, I hope to see the proportion of natural landscape is greater than man-made landscape;	7.355	.007	1.657
Natural elements	I hope the CCG is a place without natural landform;	4.596	.032	.734
Natural elements	I hope the CCG is a place with many evergreens;	8.767	.003	1.891
Facility	I hope the CCG have many small squares in it;	4.01	.045	.658
Facility	I hope the CCG have pergolas and pavilions in it;	8.923	.003	2.306
Facility	I hope the CCG have a snack bar in it ;	3.912	.048	.748

(Chart-1)

Predictors of Outdoor Environment Use Frequency: Binary Logistic Regression identified significant predictors influencing people’s outdoor environmental use. Six predictors were teased out with explanation of 67% of total variances. Three of them came from facility category; two came from Natural Element category and one from Bird-eye View (Chart-1)

Generally speaking, Affordances variables took a great majority in all significant predictors. The natural environment and facilities influencing the fulfilment of people’s activities were two big groups.

Hierarchy of significant predictors: AnserTree analysis aimed to identify the order in which six predictors worked on residents’ outdoor environmental use frequency and the relationship among them. With 72.4% of totally accurate rate, the diagram shows the most important four discriminators with good discriminating effect (Chart-2).



(Chart-2)

Conclusion:

- 1) Both Prospect and Affordances have significant influences on residents' outdoor environmental use frequency, especially Natural Element and Facilities aspects of Affordances (Figure-7).
- 2) The effect of Affordances is relatively more important than Prospect on residents' frequency of the outdoor environmental use. 'Affordances' items locate on the top of the hierarchy higher than the position of the 'Prospect' items reflected as Bird-eye view.
- 3) Green space and Function are two main domains for residents. Detailed analysis through the hierarchy found out that Green/Nature category played a more important role than Facilities of the environment on residents' real use. The first attractive attribute of the outdoor environment is plants, then the facilities to satisfy users' particular needs (Figure-8).

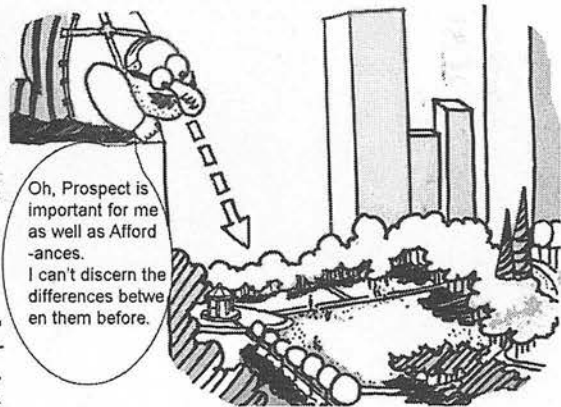
Generally speaking, in Chinese HRFRA, Affordances of outdoor environment—Natural elements and Facilities of the environment are relatively more important than Prospect—the Bird-eye view on residents. They preferred the environment with more natural elements rather than man-made landscapes. In human-centred design, Designers might satisfy the needs of residents with the Green/Nature in mind first, followed by Function and Aesthetic.

The position of Affordances in the hierarchy higher than Prospect shows the sequence of the action people usually take in the familiar environment is different with those unfamiliar ones. In these environment, people often browse the environment first then focus on the details among it. This might be caused by the age distribution of the respondents because most of users are old people and women. Further study should identify the reasons for this.

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(Claim: All handdrawings are authors own work except figure-4 and figure-5)



(Figure-7)



(Figure-8)